FIVE-YEAR REVIEW

SECOND FIVE-YEAR REVIEW REPORT

for

MIDCO II
GARY, INDIANA

MAY 2004

Prepared by:

United States Environmental Protection Agency
Region 5
Chicago, Illinois

Approved by:

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5-17-04

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LIST OF ACRONYMS AND ABBREVIATIONS

AWQC	Ambient Water Quality Criteria
cm/sec	centimeters per second (a unit for hydraulic conductivity)
Consent Decree	Consent Decree for Civil Action No. H 79-556, United States of America vs Midwest Solvent Recovery, Inc., et al. (Defendants); American Can Company, Inc., et al. (Third Party Defendants); vs Accutronics, et al. (Third Party Defendants), which was filed in the United States District Court in Hammond, Indiana on July 23, 1992.
CR	cumulative, incremental lifetime cancer risk
ENVIRON	ENVIRON International Corporation, a consultant for the MRC from June 2000 to the present
EPA	United States Environmental Protection Agency
ERM	Environmental Resources Management – North Central, Inc. or ERM-Enviroclean – North Central, Inc., affiliated consulting firms working for the MRC from around 1987 – September 2002
ESD	Explanation of Significant Differences (EPA document to describe and explain changes to the ROD that do not require an amendment)
ESD#1	Explanation of Significant Differences dated 1 / 9 / 96 (EPA document to change MAC and GWCAL for 1,1-dichloroethane)
ESD#2	Explanation of Significant Differences dated 11 / 2 / 99 to change the MAC and GWCALs for certain polyaromatic hydrocarbons
ESI	The MRC's contractor for data validation
GWCALs	groundwater cleanup action levels (these are concentrations of contaminants required to be achieved at the end of the groundwater cleanup)
HBLs	Health Based Levels used to evaluate requests to delist hazardous wastes under the Resource Conservation and Recovery Act (for groundwater HBLs were set equal to the MCL or to the more stringent of CR = 10^{-6} or HI =1.0 for residential water usage if an MCL was not available)
HEAST	EPA's 1997 Health Effects Assessment Summary Tables

HI	cumulative incremental non-carcinogenic hazard index
IDEM	Indiana Department of Environmental Management
InDOT	Indiana Department of Transportation
IRIS	EPA's Integrated Risk Information System.
MACs	maximum allowable concentrations (the treated groundwater must be less than these concentrations before being deep well injected)
MCLs	Primary Maximum Contaminant Levels from 40 CFR 121
mg/kg	milligrams per kilogram, a unit for contaminant concentration in soil, equal to parts per million
mg/m^3	milligrams per cubic meter (a unit for concentration of fugitive dust)
MRC	Midco Remedial Corporation (a corporation formed by the Settling Defendants to the Midco I and Midco II Consent Decree for the purpose of implementing the requirements of the Consent Decree)
NCEA	EPA's National Center for Environmental Assessment
psi	pounds per square inch (a unit for compressive strength)
PAHs	Polyaromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PRG	EPA, Region 9's preliminary remediation goals
PSGW	Project specific groundwater parameter list. This was a compilation 243 contaminants that are included in the Contract Laboratory Program Target Compound List and Target Analyte List, and additional contaminants listed in Appendix IX of 40 CFR § 261
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
Review	the second Five-Year Review
RfD	Reference Dose for non-carcinogenic health effects

RfD_i	Inhalation non-carcinogen reference dose
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision (EPA's official decision document). Unless otherwise noted, this refers to the 1989 ROD as updated by the 1992 ROD Amendment and the two ESDs.
RPM	EPA Remedial Project Manager
sediment/ soil CALs	sediment/soil cleanup action levels (required to be achieved in soil below sediments that are excavated)
SF	Cancer potency factor
SF_i	Inhalation cancer potency factor
SOP	Standard Operating Procedures, which are procedures used by a laboratory for conducting a chemical analysis
SOW	Statement of Work, Appendix I to the Midco I and Midco II Consent Decree
S/S	solidification/stabilization
STALs	soil treatment action levels (source area soils that exceed these action levels must be treated by S/S and or by SVE)
SVE	soil vapor extraction
SVOCs	semivolatile organic compounds
ug/l	micrograms per liter, a unit used to express the concentration of contaminants in groundwater and is equal to parts per billion in water
UIC	EPA, Region 5's Underground Injection Control Branch
VOCs	volatile organic compounds
Weston	Weston Solutions, Inc., EPA's oversight contractor

EXECUTIVE SUMMARY

The selected remedy includes access and deed restrictions, excavation of contaminated soil from the ditch north of Midco II and consolidation of the excavated soil onto the source area, groundwater pump-and-treat and disposal via deep well injection, soil treatment by soil vapor extraction (SVE) and solidification / stabilization (S/S), and a site cover over the source area. The remedial actions are being implemented under a Consent Decree by a group of Settling Defendants, who have formed the Midco Remedial Corporation (MRC) to implement the remedy. EPA is overseeing implementation of the remedy.

The access and deed restriction, and groundwater cleanup portions of the remedy are functioning as intended in the ROD, including complying with air emission limitations and deep well injection requirements for disposal of the treated groundwater. EPA staff believe that the pump-and-treat system is capturing all of the groundwater contamination from the Midco I operation, and there have been reductions in the concentrations of some groundwater contaminants. Operation and monitoring concerns have included:

- an inadequate data validation process;
- inadequate reporting of problems related to complying with groundwater treatment requirements (maximum allowable concentrations or MACs) prior to deep well injection;
- containment of the VOC plume east of monitoring well cluster T;
- pulling off-site contamination into the groundwater cleanup area;

EPA has submitted letters to the MRC to resolve problems with the data validation, and reporting. The annual monitoring data will be closely observed for signs of VOC plume migration east of cluster T, especially trends at P-3. Additional monitoring wells will be installed east of cluster T if necessary to monitor this plume. In addition, trends in inorganic contaminants will be observed closely for signs of migration of off-site contaminants into the groundwater cleanup area. Additional characterization of off-site groundwater contamination will be performed if necessary.

Implementation of the soil treatment phase has been delayed. Apparently as a result of this, concentrations of some contaminants in the most highly contaminated source area groundwater have not been significantly reduced. In November 2003, the MRC conducted a pilot test for the SVE / air sparging system, and they are in the process of designing the full-scale system. The MRC will conduct SVE to remove at least 97% of the VOCs from the soil. The air sparging is not required in the ROD. Conducting air sparging concurrent with SVE will be more effective at removing VOCs from under and near the water table than the ROD remedy. Following completion of the SVE, the ROD requires soil treatment by S/S and then construction of a RCRA compliant cover over the source area.

Some contaminated sediments and soil from the ditch north of Midco II have been excavated and consolidated onto the source area, but contamination remains in the

soils left in place. The site fence has been extended around the remaining contaminated sediments / soils in the Midco II ditch to restrict human access. It would be most efficient to address the risks from the remaining contaminated soils in the sediment areas, during design and construction of the site cover. Although wildlife can be exposed to the contaminants remaining in these sediment areas, EPA has decided that it is acceptable to reduce costs by delaying action on the contaminated sediment areas until the site cover is designed and constructed because the area affected is small, and the value of the habitat is minor.

EPA determined that the toxicity factors and exposure assumptions for evaluating air emissions, and the treatment requirements prior to deep well injection are protective. However, the groundwater cleanup action levels may need to be updated before the pump-and-treat system is shut-down.

In summary, the access / deed restrictions and groundwater remedial actions at Midco II currently protect human health and the environment because contaminated groundwater from Midco II is being contained, because air emission and deep well injection requirements are satisfied, and because direct contact with the contaminated soils and groundwater is being prevented. However in order to assure that the remedy remains protective the following actions need to be implemented:

- improved notification and reporting of operating and maintenance problems affecting compliance with the MACs;
- more comprehensive data validation;
- closely observe trends in VOC concentrations along the east boundary of the monitoring well network , and metals concentrations in outer monitoring wells;
- install additional monitoring wells east of the site and better characterize off-site and background contamination, if necessary; and
- when evaluating a request for shutdown update the groundwater cleanup action levels if necessary.

The sediment excavation, soil treatment and site cover phases of the remedy are expected to be protective of human health and the environmental upon completion, and the interim exposure pathways that could result in unacceptable risks are being controlled.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Midco II		
EPA ID *(from WasteLAN)*: IND980679559		
Region: 5	**State:** IN	**City/County:** Gary / Lake
SITE STATUS		
NPL status: X Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): X Under Construction X Operating ☐ Complete		
Multiple OUs?* X YES ☐ NO	**Construction completion date:** NA ___ / ___ / _____	
Has site been put into reuse? ☐ YES X NO		
REVIEW STATUS		
Lead agency: X EPA ☐ State ☐ Tribe ☐ Other Federal Agency		
Author name: Richard Boice		
Author title: Environmental Engineer	**Author affiliation:** U.S. EPA	
Review period:** 9 / 4 / 03 to 5 / ___ / 2004		
Date(s) of site inspection: 4/30/04, 10/20/03, 11/11 – 11/19/03, 10/14 – 10/16/03, 8/14/03, 6/24/03		
Type of review: X Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) X 2 (second) ☐ 3 (third) ☐ Other (specify)		
Triggering action: ☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____ ☐ Construction Completion X Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date *(from WasteLAN)*: 10 / 29 / 1998		
Due date *(five years after triggering action date)*: 10 / 29 / 2003		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Issues:

1. Data quality problems identified in 10% validated data are not evaluated in the rest of the data.
2. Changes in operation and monitoring of the of the pump-and-treat system affecting compliance with the treatment requirements prior to deep well injection (maximum allowable concentrations or MACs) are sometimes not being reported to EPA.
3. Pump-and-treat system may be pulling in off-site contamination.
4. Soils and sediments in portion of Midco II ditch north of the site exceed soil CALs.
5. The extent of east VOC plume is not well defined.
6. Soil treatment is behind schedule.
7. Some toxicity factors and exposure assumptions for air emissions are out of date
8. Some of the treatment standards prior to deep well injection (MACs) are out of date
9. Some groundwater cleanup action levels (GWCALs) are out of date
10. Some soil cleanup action levels (Soil CALs) are out of date

Recommendations and Follow-up Actions:

The MRC must review all data for problems identified in the 10% manually validated data. EPA sent out a letter on this dated April 8, 2004. The MRC must report operational changes affecting MAC compliance to EPA and include operating parameters in its monthly progress reports. EPA sent out a letter on this dated May 6, 2004.

To address concern about pulling off-site contamination into the pump-and-treat system contaminant trends in boundary monitoring wells will be closely watched, and off-site groundwater contamination will be better characterized if necessary. To address the concern about the extent of the VOC plume, trends in VOC data in P-3 will be closely watched, and an additional nest of monitoring wells installed necessary.

To address concern about soil exceeding soil CALs in the sediment areas and the protectiveness of the soil CALs, ecological and human health risks will be considered and further evaluated if necessary during design of the site cover.

To address concern about the delay in soil treatment, the MRC should proceed with the soil treatment in accordance with the schedule in Figure 12 of the *Soil Treatment Design/Build Report Alternative Remedy Revision 1*. EPA will attempt to expedite its review of design documents.

EPA determined that the toxicity factors and exposure assumptions for air emission and the treatment standards prior to deep well injection (MACs) are protective. However, the protectiveness of the GWCALs needs to be evaluated prior to shut-down of the pump-and-treat system.

Protectiveness Statement(s):

In summary, the access / deed restrictions and groundwater remedial actions at Midco II currently protect human health and the environment because contaminated groundwater from Midco II is being contained, because air emission and deep well injection requirements are satisfied, and because direct contact with the contaminated soils and groundwater is being prevented. However in order to assure that the remedy remains protective the following actions need to be implemented:

- improved notification and reporting of operating and maintenance problems affecting compliance with the MACs;
- more comprehensive data validation;
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- install additional monitoring wells east of the site and better characterize off-site and background contamination, if necessary; and
- when evaluating a request for shutdown update the groundwater cleanup action levels if necessary.

The sediment excavation, soil treatment and site cover phases of the remedy are expected to be protective of human health and the environmental upon completion, and the interim exposure pathways that could result in unacceptable risks are being controlled.

I. Introduction

This report presents the methods, findings, conclusions, and recommendations of the second Five-Year Review (Review) for the Midco II site located in Gary, Indiana. The purpose of this Review is to evaluate implementation and performance of the remedial actions in order to determine whether or not the remedy is or will be protective of human health and the environment. The remedial action that EPA selected for the Site is expected to result in hazardous substances remaining above concentrations that would limit use and restrict exposure at the end of the remedial action. Therefore, a Five-Year Review is required by statute.[1]

This report was prepared by Richard Boice, who has been the Remedial Project Manager (RPM) for the United States Environmental Protection Agency (EPA) for Midco II since 1985. The Review relied upon documentation or evaluations conducted by the following parties:

- Weston Solutions, Inc. (Weston), EPA's oversight contractor since 1985;
- Environmental Resource Management, (ERM) a consultant for the Midco Remedial Corporation (MRC)[2] from 1985 through September 2002;
- Environ International Corp. (Environ), a consultant for the MRC from June 2000 through the present;
- David Brauner, Ecologist, EPA;
- Edward Karecki, Ecologist, U.S. Fish and Wildlife Service;
- EPA, Region 9, Technical Support Team.

The following parties also reviewed and provided input into the Review before it was completed:

- the EPA Region 5, Underground Injection Control Branch (UIC);
- the Indiana Department of Environmental Management (IDEM);
- the MRC.

Work specifically on this Review was initiated by the RPM on September 4, 2003, but, oversight of the remedial actions and evaluation of the remedy have been an ongoing process for the last five years. This oversight and evaluation has included periodic on-site inspections; oversight of monitoring; and review of reports on operation, monitoring, pilot and treatability testing, conceptual remedial alternatives, design documents, and

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[1] Section 121(c) of the Comprehensive Environmental Response Compensation and Liability Act, 42 U.S.C. § 9621 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and Section 300.430(f)(4)(ii) of the National Contingency Plan, requires periodic review (at least once every five years) for sites where hazardous substances, pollutants or contaminants will remain above levels that would allow unlimited use and unrestricted exposure after completion of the remedial action.

[2] This is a corporation started by Settling Defendants to the Midco I and Midco II Consent Decree. The purpose of the Midco Remedial Corporation is to implement the requirements of the Midco I and Midco II Consent Decree.

modifications to reduce costs and increase efficiency. This Review was officially completed on the signature date. The scheduled date for completion of the Review was October 29, 2003 (five years from October 29, 1998, the signature date of the 1998 *Five-Year Review Report*). This report will be placed in the Midco II Administrative Record file located at EPA's office at 77 W. Jackson Boulevard, Chicago, Illinois, and in the local document repository, which is located in the City of Gary Public Library.

II. Site Chronology

The attached Table 1 provides a chronology of past events, and Table 2 provides the future schedule.

III. Background

Physical Characteristics

The Midco II source area occupies approximately seven acres of sandy soil and fill located at 5900 Industrial Highway, Gary, Indiana (see Figure 1). Man has extensively modified the original ridge and swale topography. The Midco II source area was filled in with industrial wastes to create a relatively flat surface during the 1950s and 1960s. Farther east and north of the site remnants of some of the original ridge and swale topography is present. The ditch bordering the northeast boundary of the site drains into the Grand Calumet River approximately 2 miles southeast of Midco II.

Midco II is 1.14 miles south of Lake Michigan and 0.85 miles north of the Grand Calumet River. There are a number of relatively undisturbed, state-designated nature preserves within a three-mile radius of Midco II. These areas and other relatively undisturbed areas, provide habitat for a wide variety of migratory and resident wildlife populations. Wetland vegetation exists in the ditch on the northeast border of Midco II. Mallard broods were observed in this ditch. At the time of the Remedial Investigation (RI), the mallard was a designated species of special emphasis by the U.S. Fish and Wildlife Service. Blanding's turtle, at the time of the ROD, a State of Indiana-designated endangered species, was observed near Midco II. In addition, Midco II is within the range of the Indiana bat, which at the time of the ROD was a federally-designated endangered species. The southern end of Lake Michigan is a convergence area for migratory birds following the north-south boundaries of the Lake.

The only aquifer of concern at Midco II is the Calumet aquifer, whose water table is about 8 feet below the surface. The Calumet aquifer is 45 – 50 feet thick at Midco II and is underlain by about 62 feet of soft silty clay and silty clay loam, and 6 feet of hard

silty till. If no action was taken, the Midco II contaminated groundwater would probably eventually vent to the Grand Calumet River.

Land and Resource Use

Midco II is in a predominantly industrial area where 34 other potential hazardous waste sites have been identified. Midco II is bordered by a former auto salvage yard on the northwest, a ditch and CSX railroad right-of-way on the northeast, vacant filled-in land now owned by the Gary – Chicago Redevelopment Zone on the southeast, and Industrial Highway on the southwest. The Gary – Chicago Airport is located on the southwest side of Industrial Highway across from Midco II. There are a few residential homes near the corner of Clark Street and Industrial Highway, about 1 mile southeast of Midco II. Industrial Highway, the railroad and ditch on the northeastern boundary of Midco II, and the airport were in existence in 1954. During the 1950s and 1960s much of the Midco II source area, as well as much of the surrounding land between Industrial Highway and the ditch were filled in. The Gary – Chicago Airport Authority have plans to use the Midco II property as part of an expanded airport – either as part of the airport itself or as a support facility.

During the early development of northwest Indiana, the Calumet aquifer was an important source of residential water. However at this time, the Calumet aquifer is little used, and the predominant source of residential and industrial water in the Midco II area is Lake Michigan. The Calumet aquifer is very susceptible to contamination because it is a surficial aquifer and the area is heavily developed for both industrial and residential uses. The Calumet aquifer is contaminated in many localized areas, but the majority of the aquifer still has acceptable quality for drinking. A well inventory conducted during the RI around 1988, identified 11 private wells screened in the Calumet aquifer within approximately one mile of Midco II. Nine of these wells were used by businesses for non-drinking purposes, and two were residential wells that are no longer in use. It was found that the residences at Clark and Industrial Highway, being somewhat isolated from other residential areas, had their own wells. EPA connected one of these residences to the water system because cyanide contamination was detected in its well. EPA investigated this contamination and determined that Midco II was not the source of the cyanide contamination. There are no wells downgradient from Midco II that are used for drinking, but there were two wells on airport property that were used for non-drinking purposes.

History of Contamination

Waste operations at Midco II were initiated during the summer of 1976. In January 1977 (following a major fire at Midco I), Midwest Industrial Waste Disposal Company was incorporated ostensibly to operate Midco II, and the Midco I operations were transferred to Midco II. Operations included temporary bulk liquid and drum storage of waste and reclaimable materials, neutralization of acids and caustics, and on-site disposal of liquids via dumping into pits, which allowed seepage of liquids into

groundwater and into the ditch. One of these pits, called the "filter bed", had an overflow pipe leading into the ditch.

By April 1977, it was estimated that 12,000 to 15,000 55-gallon drums of waste materials were stored on-site. In addition, there were 10 above and below ground storage tanks used to store liquid wastes. The drums were stacked three high, and along with the tanks were badly deteriorated and leaking. The wastes stored on the site included oils, oil sludges, chlorinated solvents, paint solvents, paint sludges, acids, and spent cyanide solutions. Also present were highly contaminated soils, and open dump containing drums, tires, and wood wastes; and an excavated pit containing unidentified sludges. On August 15, 1977, a major fire at Midco II destroyed equipment, buildings, and damaged or burned out an estimated 50,000 to 60,000 drums.

Initial Response

On February 24, 1978, the Lake County Circuit Court ordered Midwest Solvent Disposal Company to remove and properly dispose of drums of cyanide and other hazardous wastes from Midco I and Midco II. In August 1979 EPA conducted sampling and an inspection at Midco II. Based on these results, the United States filed a complaint in Federal District Court pursuant to Section 7003 of the Resource Conservation and Recovery Act (Civil Action 79 – 556). A preliminary injunction and temporary restraining order was granted on January 31, 1980 that directed the Midco II property owner to report on efforts to remove surface wastes from Midco II. On December 4, 1980, the Court ordered Midwest Solvent Disposal Company to submit a plan for removal of all wastes from Midco II, and to design a plan to determine the nature and extent of soil and groundwater contamination. However, these Court actions were ineffective.

In August 1981, EPA installed a 10-foot high fence around Midco II. In two separate removal actions in 1984 and 1985, EPA removed all of the drums, tanks, and surface wastes. Also in 1985, EPA excavated contaminated soil and material from the sludge pit and filter bed, which were highly contaminated by PCBs and cyanide. The sludge pit and filter bed contents were temporarily contained on Midco II. The sludge pit and filter bed contents were removed from Midco II and disposed off-site, in a number of removal actions conducted between 1985 and 1989.

Midco II was placed on the National Priorities List in October 1984. Shortly after EPA initiated the Remedial Investigation/Feasibility Study (RI/FS), EPA reached a settlement with a group of potential generators to conduct the RI/FS and reimburse EPA costs. The group of generators conducted the RI/FS from 1985 through 1989. After the completion of the public comment period on the Proposed Plan, EPA issued the Record of Decision (ROD), in June 1989.

Basis for Taking Action

The RI included evaluation of the hydrogeology, and extensive sampling of

groundwater, source area subsurface soils, and surface sediments in surrounding wetlands. All sampling and analyses were conducted in accordance with an EPA approved Quality Assurance Project Plan (QAPP). Samples were analyzed for the full list of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticide/PCBs, and inorganics (metals and cyanide) included in the routine analytical services of EPA's Contract Laboratory Program (this will be referred to as the Target Compound List (TCL) for organic contaminants, and Target Analyte List (TAL) for inorganic contaminants. In addition, 16 samples from test trenches in some of the most contaminated source areas were also analyzed for 2,3,7,8-tetrachlorodibenzodioxin. Groundwater samples were also analyzed for chlorides and other general water quality parameters.

The RI demonstrated that the source area soils, and the groundwater near the site were highly contaminated. For residential usage of groundwater, the lifetime, cumulative carcinogenic risk was estimated to be 2.6×10^{-2} and the cumulative non-carcinogenic risk index was estimated to be 124. For residential soil exposures, the lifetime, cumulative carcinogenic risk was estimated to be 3.3×10^{-4}, and the cumulative non-carcinogenic risk index was 2.99. There were also significant risks to off-site property owners, and to biota in the vicinity of the site.

The groundwater results exceeded the Safe Drinking Water Act Maximum Contaminant Levels (MCLs) for the following contaminants:

benzene	arsenic	bis(2-ethylhexyl)phthalate
1,1-dichloroethylene	barium	
1,2-dichloropropane	beryllium	
ethylbenzene	cadmium	
methylene chloride	chromium	
tetrachloroethylene	cyanide	
toluene	lead	
trans-1,2-dichloroethylene	mercury	
1,1,1-trichloroethane	silver	
trichloroethylene	selenium	
vinyl chloride	thallium	
xylene	copper	

Other contaminants of concern include:

acetone	aluminum	chlordane
bis(2-chloroethyl)ether	antimony	cresol
2-butanone	iron	1,4-dichlorophenol
chloroform	nickel	di-n-butylphthalate
1,1-dichloroethane	zinc	n-nitrosodiphenylamine
4-methyl-2-pentanone	vanadium	2,4-dimethylphenol
1,1,2-trichloroethane	manganese	isophorone
1,2-dichlorobenzene	PAHs	PCBs
butylbenzyl phthalate	pentachlorophenol	phenol

No 2,3,7,8-tetrachlorodibenzodioxin was detected. An unanticipated result was that the aquifer in the vicinity of Midco II is highly salinity, mostly sodium and potassium chlorides. Chloride is as high as 60, 000 mg/l below the site. It has been theorized that most of the high salinity was caused by fill containing secondary aluminum smelting waste although it appears that disposal in the filter bed also contributes to the salinity.

IV. Remedial Actions

REMEDY SELECTION

Remedial Objectives

The remedial objectives used to select the remedial action included:

- Eliminate direct contract threat from contaminated source area soil and sediments;
- Treat the principal threat in soil to substantially reduce the threat of groundwater contamination and the direct contact threat;
- Prevent off-site migration of contamination in groundwater;
- Assure that contaminants do not adversely affect biota;
- Cleanup groundwater.

ROD Requirements

The 1989 ROD as amended by the 1992 ROD Amendment provides for the following remedy components:

- Excavation and on-site solidification/stabilization (S/S) of contaminated sediments and underlying soils in the ditch northeast of Midco II;
- Construction and operation of a ground water extraction system to contain and cleanup contaminated ground water;
- Construction and operation of a deep underground injection well for disposal of the contaminated ground water, and treatment prior to deep well injection, if necessary;
- Treatment of highly contaminated soil by a combination of S/S and soil vapor extraction (SVE);
- Construction of a final cover, access restrictions, deed restrictions and monitoring.

The attached Table 3 provides a summary of the ROD cleanup and performance requirements applying to each of these remedy components:

Based on updated toxicological information, the MAC was relaxed and the GWCAL

made more stringent for 1,1-dichloroethane in ESD#1, which was issued on January 9, 1996. Also using updated toxicological information, the MACs for a number of the polyaromatic hydrocarbons were relaxed, the inhalation carcinogenic potency factor for hexavalent chromium corrected, and oral and inhalation carcinogenic potency factors for vinyl chloride added, in ESD#2, which was issued on November 2, 1999.

REMEDY IMPLEMENTATION

Settlement

EPA, the State of Indiana and Settling Defendants entered into an agreement on the final remedial actions for both Midco I and Midco II in a Consent Decree, which became effective on June 23, 1992. The Settling Defendants formed the Midco Remedial Corporation (MRC) to carry out the remedial actions. The MRC contracted with ERM and later with Environ to be the MRC's primary contractor for design, construction, operation, maintenance and monitoring of the remedial actions.

Quality Assurance

In accordance with Consent Decree requirements, all sampling data for the remedial design and remedial action work have been produced in accordance with procedures in an EPA-approved Quality Assurance Project Plan (QAPP). EPA approved the *Remedial Design / Remedial Action Quality Assurance Project Plan* dated May 14, 1993. This QAPP defined sampling and analytical procedures, and provided for validation of 100% of the data by an independent contractor.

The SOW requires that the groundwater monitoring samples be analyzed for all contaminants on the TCL/TAL and additional contaminants listed in Appendix IX of 40 CFR § 261 that were detected during the first round of sampling. To address this requirement during preparation of the QAPP, a list of 243 project specific groundwater parameters (PSGWs) were developed, which included the TAL/TCL and additional hazardous constituents included in Appendix IX. The PSGWs were divided into the following organic and inorganic fractions for the analyses: VOCs, direct injection VOCs, methanol, SVOCs, low concentration PAHs, chlorinated pesticides/PCBs, organophosphate pesticides, herbicides, dioxin and furans, metals, cyanide, sulfide, fluoride, and hexavalent chromium. The parameters in each fraction and the project-required detection limits are listed in the attached Table 4, which is Table 3-2 of the QAPP. Following the initial sampling the PSGWs were reduced to 180 contaminants to be included in the annual groundwater monitoring and MAC compliance testing. This groundwater monitoring list is identified in the attached Table 5.

From time to time, the QAPP has been corrected and amended as follows:

- March 29, 1996, EPA approved Quality Assurance Project Plan Addendum, ERM, February 29, 1996, for the purpose of adding laboratory standard operating procedures (SOPs) to allow use of additional laboratories and to make

corrections;

- April 25, 1996, EPA approved a revised SOP for CompuChem's direct injection procedures for methanol analysis.
- June 9, 1997, EPA approved revised SOPs for analysis of herbicides by IEA, Inc.
- April 18, 2000, EPA approved a low-flow sampling method for sampling the piezometers, and use of OLM4.2 instead of the low concentration method for volatile organic compound analyses for wells containing more than 1000 ug/l of VOCs because it was found that ketone results were not useable using the low concentration method.
- August 21, 2002, EPA approved reducing manual data validation to 10% of samples and a change in validation contractors.
- May 7, 2004, EPA approved a revised sulfide SOP.

EPA and Weston site managers routinely review the validation reports. In addition, a Weston chemist has audited a number of the data validation reports by checking the validation report against information in the raw data packages. The attached Table 6 summarizes the results of these audits. Except for the audit of the Midco II sediment sample results conducted in November 1994, the audits verified that the data was reliable and that the validation had been properly conducted.

EPA, IDEM, and Weston have routinely monitored data quality and data interpretation through review of monitoring reports. This has included annual groundwater monitoring reports, air monitoring data, capture zone evaluations, soil treatability study results, soil treatment proposals, and other documents submitted by the MRC. EPA and Weston's review of the *2002 Annual Ground Water Monitoring Report* identified the following problems with validating only 10% of the samples:

- all samples were to be validated using field QC data, but this was done only for the manually validated samples.
- the data that were not manually validated were not checked for the data problems and data qualifiers resulting from the manual validation.

EPA and Environ have agreed that in the future any data quality problem identified in the data that is manually validated will also be manually checked in the remainder of the data.

In 1999 EPA tasked Weston to perform hydraulic modeling to evaluate the Midco II water level data. Subsequently EPA and the MRC agreed to use Weston's modeling to evaluate water level data to estimate the extent of groundwater capture, and evaluate alternatives for expansion and redistribution of groundwater pumping.

To evaluate the quality of field sampling and measurements, EPA has had Weston provide field oversight of each of the annual groundwater monitoring events, of critical water-level monitoring events, of some of the air monitoring events, and occasionally of the treatment system influent and effluent sampling (see inspection dates and results in Table 15). Because of persistent problems with the water-level surveys, ERM with input from EPA and Weston developed standard operating procedures for water level

measurements during 1998 and 1999. The UIC oversees testing of the deep injection well.

EPA has overseen the quality of construction by reviewing and approving design documents, and by field oversight of the construction. Weston provides support to EPA in review of design documents, and IDEM also participates in this review. The design documents have included construction quality assurance plans, which define procedures to be implemented to assure that the construction meets the specifications. The RPM, IDEM site project manager, IDEM technical specialists, and Weston also review construction completion reports. The EPA Region 5 UIC reviews documents related to the deep underground injection well. EPA has tasked Weston to provide field oversight of all construction and remedial actions (see Table 15) other than the deep well work, while the Region 5 UIC has overseen construction work for the deep injection well.

EPA oversees operation and maintenance of the pump-and-treat and deep well injection system, through on-site inspections, review of the Operation and Maintenance Plan, health and safety plans, monthly progress reports and other documents related to operation and maintenance. The operation and maintenance must be in accordance with the EPA-approved Operation and Maintenance Plan. The RPM, the Region 5 UIC program, and the Weston site manager have routinely reviewed the MRC's monthly progress reports, and have periodically inspected the facility for operation and maintenance (see Table 15).

Health and Safety

Contractors for the MRC have prepared health and safety plans, which have been reviewed by EPA. ERM prepared the following Health and Safety Plans to cover remedial design and remedial action activities:

- Remedial Design/Remedial Action Health and Safety Plan, May 14, 1993;
- Construction Health and Safety Plan, August 1994;
- Operating and Maintenance Health and Safety Plan, November 1996.

Weston and EPA inspectors consider safety during their on-site inspections. During an inspection on February 14, 2001, a Weston inspector identified concerns about health and safety procedures. In response to this, Environ conducted an audit of the operation and maintenance health and safety activities, and certain improvements were implemented (see March 13, 2001 Environ letter).

Access and Deed Restrictions

The soil and ground water treatment and containment actions have not yet been completed. However, in the interim the site remains protective of public health through access and deed restrictions. Access to the site was already restricted prior to the MRC taking over the remedy. The MRC has expanded the site fence as needed to

enclose an expanded area of potential soil contamination, the groundwater treatment facility, and contaminated sediments that were not excavated. The present extent of the Midco II fence is shown in Figure 2.

In addition to the fence, Environ personnel help to restrict access. Environ personnel are present on the site almost every day to operate the ground water treatment system. These personnel will be able to observe evidence of trespassing on the site and initiate corrective measures. In addition, EPA representatives visit the site several times each year.

The Consent Decree requires that certain Settling Defendants perform the following actions relative to deeds and the land records applying to the property that they own:

- file an EPA-approved notice to subsequent property owners in the land records of Lake County that they own part a facility where hazardous substances were disposed of;
- notify EPA and the State of Indiana prior to transfer of the property, and assure that any deed, title or other instrument of conveyance of the property must contain a notice that the property is subject ot the Consent Decree;
- record a copy of the Consent Decree in the chain of title in the land records of Lake County, Indiana for property that they own;
- file in the land records a deed/use restriction in the form shown in Attachment 1 to this report (Appendix 8 of the Consent Decree).

To the extent that property is not owned by the Settling Defendants, the Consent Decree requires them to use their best efforts to cause the owners of such property to implement the deed notices, and restrictions identified above. According to first Annual Report to the Court, in 1992 the Settling Defendants monitored and assisted in placing deed restrictions in the land records for property within the Midco I and Midco II site boundaries.

Compliance with Air Emission Requirements

The Investigation and Monitoring Plan (ERM, 1993) requires monitoring of air emissions, and ambient air for VOCs and particulates. In addition, monitoring air emissions with a photoionization detector is required during intrusive work for health and safety reasons. As described in the 1998 *Five-Year Review Report*, EPA determined that air emissions during sediment excavation, and during operation of the groundwater treatment system were well below the air emission criteria. For that reason, EPA approved discontinuation of air emission and ambient air monitoring for the groundwater treatment system. EPA revisited the air emission concerns in 2002 during design of the expanded Midco II treatment system to increase the groundwater extraction rate to 50.6 gpm and add a clarification treatment system. EPA decided that no further air emission testing was necessary because the clarification system was sealed except for the passive air emission vent, and a carbon canister was added to the vent.

During excavation within the "deep sediment area" the backhoe operator had to wear level B protection because the HNu readings exceeded 5 ppm.

During the pilot test for the SVE / air sparging system conducted during November 2003, air emissions were controlled with an activated carbon unit as required by the SOW. Air into and out of the carbon unit, and ambient air were monitored in order to better design the air emission controls for the full-scale system.

For design of the SVE system, Environ expects to use an afterburner to reduce VOC emissions. EPA will require Suma canister samples from the emissions, and upwind and downwind locations to evaluate compliance with the air emissions criteria. Because it may be impossible to meet the 10^{-7} cancer risk criteria at the property boundary, EPA has agreed to apply this criteria at the nearest residence instead of at the property boundary.

On-site storage and off-site Disposal

In the ROD, EPA determined that the following listed hazardous waste as defined in the Resource Conservation and Recovery Act (RCRA) had been disposed on-site: F001; F002; F003; F005; F007; F008; and F009. For this reason, any residuals from treatment of groundwater or soil must be handled and disposed of as a RCRA hazardous waste unless testing is conducted to demonstrate that the waste is not hazardous under RCRA. This would include the pre-filters from the groundwater treatment. Judy Kleiman, the RCRA/Superfund Coordinator stated that the post filters qualify as debris and are regulated by 40 CFR 268.45 (see December 21, 1998 memorandum). Judy Kleiman also clarified that the pre-filters could not be disposed under the site cover (see January 14, 1999 conversation record).

The MRC has stored soil from drill cuttings, personal protective equipment, and oily sludge in barrels, which were stored either in a domed enclosure with a concrete base in the support zone or enclosed within a fenced area on the site, and protected by placing on pallets and under a tarp. Pre-filters and post-filters were segregated and stored in the exclusion zone on top of a tarp, and with a covering tarp. Starting in February 2003, dewatered sludge from the new clarification system is stored under a tarp in plastic bags on the site. This sludge has been tested and determined not to be hazardous under RCRA. Wastewater residuals from sampling were disposed of by adding to the influent to the UV/HP unit.

From November 27 – December 19, 1998, ERM emptied barrels containing soil cuttings from the monitoring well installation onto the flexible membrane liner covering the sediment storage area, and the empty barrels were crushed. A new synthetic liner was placed over the sediment area in March 1999. In December 1998, the MRC contracted with Waste Management Industrial Services, Calumet City, Illinois to manage transport and off-site disposal of 10,400 pounds of oily sludge from the oil/water separator. The disposal facility was Chemical Waste Management, Port

Arthur, Texas, where waste was incinerated. This facility was in compliance with EPA's off-site policy.

On September 18 and 25, 2001, waste filters from the treatment system were transported off site for disposal by "microencapsulation" at Environmental Quality Company, Belleville, Michigan.

Environ is planning for another disposal event. The remaining prefilters will be disposed as RCRA hazardous wastes, and the dewatered clarifier sludge disposed as a non-hazardous waste at environmental Quality Company, Belleville, Michigan. Several loads of dewatered clarifier sludge have accumulated on the site.

Excavation of Sediments Exceeding the Soil CALs

As described in the 1998 *Five-Year Review Report*, in September 1993, the ERM conducted partial excavation of the sediments in the areas defined in the Consent Decree (see Figure 3). Most of the sediments in the "deep sediment area" were left in-place because there was insufficient space within the minimum areas for soil treatment to store all of the sediments, and because it was impractical to handle the volume of water that would be generated by further excavation (the sediments are below the water table). Outside of the "deep sediment area" 1-2 feet of sediments along with some underlying soils had been excavated. The excavated sediment/soils were placed on the Midco II site in the minimum areas for soil treatment. The sediments were mixed with ground corn cobs to absorb free water, and a temporary flexible membrane liner has been placed over the pile to prevent erosion. The condition of the flexible membrane liner is regularly inspected.

Sediment sampling after the excavation showed that some sediments continued to exceed the soil CALs, and some even exceeded the STALs. As previously noted the analytical results for the pesticide/PCB fraction were unusable, but results from the RI included PCBs as high as 34 mg/kg, and chlordane as high as 34 mg/kg in the area where the sediments were not excavated.

EPA preliminarily approved temporary isolation of the sediments by diverting the ditch around the contaminated sediments and extending the fence around the contaminated sediments. During the soil treatment and site capping phase of the remedy, the contaminated sediments will be treated by S/S and covered by the site cap. ERM completed diversion of the ditch around the contaminated sediment area and enclosure of contaminated sediments within a fence in August 1994. Since the 1998 Five-Year Review, no further action has been taken to address the sediments. In the *Midco Conceptual Work Plan Alternative Remedy*, the MRC proposed not to conduct treatment of the Midco II sediments. This proposal is not consistent with the 1992 ROD Amendment and is still under discussion.

In the interim period prior to implementation of the soil treatment and site cover phases

of the remedy, diverting the ditch is preventing the contamination from migrating downstream, and the fence is reducing the risk of human contact. In spite of this, it is possible that there is an ongoing negative impact on wildlife that live or feed in the contaminated portion of the ditch due to exposure to contaminants. This exposure will be eliminated once the soil treatment and site cover portions of the remedy are implemented. A discussion of the ecological risks is included in Section VII of this report. It should be noted that for further action other than containment of the sediments, the sampling will need to be repeated at least for pesticide/PCBs.

The fence, the flexible membrane liner over the excavated sediments, the dams and diversion piping are inspected regularly. The entrance and exit from the diversion piping have been partially replaced a couple times because of damage caused by brush fires.

Underground Pipeline

After the groundwater is treated to meet the MACs, the Midco II groundwater is pumped through an underground pipe for a couple miles to the Midco I site. At the Midco I site, the Midco I and Midco II treated groundwater flows are combined and pumped to the deep well, which is on property adjacent to Midco I.

To prevent discharge of large volumes of treated groundwater in case of rupture or damage to the pipeline, pipeline flow is monitored and totalized continuously at the Midco I and Midco II sites. The totalized flows are electronically compared every 4 hours. If the difference between the measured water flows of more than 1%, an alarm sounds and the Midco II pump-and-treat system is automatically shutdown. On January 15, 2002, this alarm and automatic shutdown was properly activated when the pipeline was damaged by construction being conducted off-site by the Elgin, Joliet, and Eastern railroad. As a result, only a minor amount of treated groundwater was released. The Midco II system was shutdown for approximately six days while the pipeline was repaired and tested.

The Midco II pump-and-treat system is also automatically shutdown if the pipeline pressure exceeds 50 psi, and the pipeline is pressure tested annually.

Deep Well Injection System

Protection of underground sources of drinking water from the deep well injection operation is assured by complying with the requirements of the EPA, Underground Injection Control program. The deep well injection is required to be into the lower Mount Simon aquifer, which is not a drinking water aquifer at Midco I because the total dissolved solids exceed 10,000 mg/l. As stated in the 1998 *Five-Year Review Report*, EPA has determined that the geologic location of the deep injection well does not meet the stringent requirements for deep injection of hazardous wastes as defined by the

Resource Conservation and Recovery Act. Therefore, the well is a Class I non-hazardous injection well, which can only inject non-hazardous fluids. The measures being implemented to comply with these requirements for a Class I non-hazardous injection well are summarized in the following EPA approved documents: *Midco Remedial Corporation, Midco I and Midco II Superfund Sites, Gary, Indiana, Underground Injection Control Permit Application*, Golden Environmental Services, Inc. June 1993; and as updated by the *Five Year Underground Injection Well Reapplication Midco WDW-1, Midco Remedial Corporation*, ERM, March 20, 1998. A list of some of the specific requirements for deep well injection is included in the 1998 *Five-Year Review Report*, and these requirements have not changed.

In 1993-1994 the Golden Environmental Services under contract with the MRC, designed and constructed the deep injection well. The well as constructed met the requirements of the Underground Injection Control Permit Application. The MRC has performed the required monitoring, including conducting and gaining EPA approval of the required annual pressure transient tests and five-year mechanical integrity tests. Monitoring for compliance with the MACs are discussed in the next section.

From time to time the MRC has made changes to the underground injection procedures, equipment, or monitoring to make improvement or increase efficiency. To address increases in injection pressure possibly caused by biological growth, ERM conducted well cleaning by injection of well cleaning fluids in 9/98, 1/00, 5/00, and 9/00. It appeared that the effectiveness of the well cleaning events was only temporary. Therefore, with EPA approval the Environ installed an acid feed system that can adjust the pH of the injectate. Using this system, the pH of the injectate is lowered to 3 – 4 when injection pressures start to rise. Since this system was installed periodic well cleaning events have been unnecessary. This system has saved money, and eliminated the downtimes needed for well cleaning.

In October 1998, the ERM conducted an inspection and workover of the deep well, which included: replacement of the carbon steel injection tubing with fiberglass tubing because of concern about corrosion of the carbon steel; replacement of some carbon steel piping with PVC piping; and cleaning and refurbishing valves. Environ reported a leak of combined treated groundwater from Midco I and Midco II at the deep well injection wellhead building on March 30, 2003 and on May 1, 2004. Both leaks were caused by a break in the aboveground piping at the wellhead, which is on InDOT property adjacent to Midco I. Environ reported an estimated release of 2,200 gallons of the combined treated Midco I and Midco II groundwater on March 30, 2003 and 1,500 gallons on May 1, 2004. In both events, Environ reported that the water leaked was contained in the sump area around the wellhead area, and was recovered. Following the March 30, 2003 release, Environ replaced the piping to the wellhead with piping with a higher pressure rating, added more bracing, and installed an alarm and automatic shut-down in response to water build-up in the the wellhead sump. Environ reported that this alarm and automatic shutdown performed properly on May 1, 2004.

Environ reported that they believe that the May 1, 2004 leak was caused by fatigue due to long-term vibrations. In response to this, Environ plans to replace the PVC pipe back to steel pipe.

Design, Construction, Operation and Maintenance of the Groundwater Pump-and-Treat System

ERM performed the initial remedial design for the ground water extraction, treatment and deep well injection system from 1993-1994. Groundwater sampling was conducted during the spring of 1993 to determine the required extent of the capture zone and to evaluate treatment options. Based on this sampling, it was determined that it would be unnecessary to treat metals, but that treatment of certain VOCs would be necessary to meet the MACs. ERM proposed and EPA approved a treatment system consisting of filtration and organic treatment using an ultraviolet light/hydrogen peroxide (UV/HP) system. The design process consisted of the following in order of treatment: an oil/water separator; an equalization tank; prefiltration using cartridge filters; an acid feed system to prevent dirt, oil or precipitates from inhibiting UV light penetration; a UV/HP unit; a caustic feed system to neutralize the acid if necessary; automated post treatment monitoring for indicator VOCs using a gas chromatograph (GC); and post treatment filtration using cartridge filters prior to pumping the treated groundwater through the pipeline to Midco I.

In 1994-95 the ERM constructed the ground water extraction, treatment and injection system. The system was optimized and tested for compliance with the MAC during 1995, and started continuous operation in February 1996.

The groundwater pump-and-treat system is to be operated and maintained in accordance with the Ground Water Remediation Systems Operation and Maintenance Plan (OMP), ERM, August 1994, Revised November 1996. Procedures in the OMP have been updated from time to time as necessary to implement improved or streamlined procedures and operate new equipment. Updates are included in the following documents:

- Ground Water Extraction and Treatment System Corrective Action Recommendations Report, ERM, August 1998, as revised by ERM's October 27, 1998 memorandum. These documents outlined measures that would be taken to improve groundwater extraction rates.
- letters re: Modification to the Extraction Well Maintenance Procedures, ERM, 9/14/98, 10/2/98 and 10/6/98.
- a letter re: Design Package for Design/Build – Clarifier System Installation, Environ, June 25, 2002.
- letter proposing increased and redistributed groundwater extraction rates, Environ, 8/30/02.

In 1999, the ERM also evaluated but decided not to implement the Macro-Porous

Polymer Extraction technology to treat the groundwater.

The influent and effluent data from the MAC compliance demonstration and the quarterly influent/effluent sampling clearly demonstrates that the treatment system can be very effective in reducing concentrations of certain VOCs and of low concentration PAHs. The following VOCs appear to be easy to reduce: monoaromatic hyrocarbons, such as toluene and phenols; chlorinated alkenes, such as vinyl chloride and cis-1,2-dichloroethylene; and some other VOCs, such as chloroethane, 1,2-dichloropropane, and methyl-isobutyl ketone. It also appears that some reduction is achieved for chlorinated alkanes such as 1,1-dichloroethane, methylene chloride, 1,1,1-trichloroethane, and 1,2-dichloropropane, but these VOCs are more difficult to treat using the UV/HP system. Acetone appears to be generated by the treatment as it is consistently higher in the effluent than the influent. However, the effluent acetone concentrations are consistently less than the MAC.

During the initial compliance demonstration sampling PAHs were not identified as a problem, but, when PAHs were detected exceeding MACs in the influent (during the quarterly influent sampling), monitoring for PAHs was added to the future compliance verification sampling and monthly effluent monitoring. The available data demonstrates that PAHs are removed by the treatment system both before and after the post filters (see the attached Table 7). Some limited testing conducted on samples collected during February 2, 2000, indicates that the post filters by themselves further reduce PAHs. There does not appear to be any definitive data documenting that SVOCs, pesticides, or herbicides on the groundwater monitoring list are treated, largely because these contaminants have been detected only infrequently and at trace concentrations.

During the fall of 2002 and winter of 2003, the Environ replaced the oil/water separator, and pre HP/UV cartridge filtration units, with a clarifier/sand-filter/sludge press system in order to reduced costs and increase the treated groundwater flow rate to an average of 50.6 gpm. According to discussion with Environ staff prior to this change, the cartridge pre-filters had to be replaced every day, and this replacement including the costs for the filters, the labor for replacing filters and disposal of the filters, was a major cost.

Groundwater Treatment and Monitoring to Meet the MACs

The Investigation and Monitoring Plan provides that, before continuous treatment and deep well injection is initiated, testing conducted over 24-hour, three-day, and four-week periods must demonstrate that the system consistently meets the MACs. During each test effluent samples must be collected periodically and analyzed for the groundwater monitoring parameters, and the results compared to the MACs. The water discharged from the one-day test had to be stored on-site until it was determined that treatment conditions resulted in compliance with the MACs. In the spring of 1995, ERM conducted a number of one-day tests under more and more severe treatment conditions. Finally, ERM concluded that the UV/HP system could not reduce 1,1-

dichloroethane to its MAC (2.5 ug/l).

The MAC for 1,1-dichloroethane in the 1992 ROD Amendment was based on an HBL, which relied upon an estimate of the carcinogenic potency of 1,1-dichloroethane from a 1985 EPA report. EPA risk assessors carefully reviewed the most up to date information on the toxicity of 1,1-dichloroethane, and concluded that it was no longer justifiable to characterize 1,1-dichloroethane as a carcinogenic compound. They recommended that the MAC be revised to 880 ug/l. This change was formalized in ESD#1. With the revised MAC for 1,1-dichloroethane, the effluent from the Midco II groundwater treatment system met all the MACs based on 24-hour, three-day and four-week tests, and the Midco II pump-and-treat system started continuous operation in February 1996.

The Investigation and Monitoring Plan provides for the following monitoring for compliance with MACs once continuous operation of the pump-and-treat system was initiated:

- every three months, sampling the treatment system influent for the groundwater monitoring parameters;
- sampling the effluent annually for the groundwater monitoring parameters;
- monthly sampling of the effluent for surrogate parameters; and
- hourly sampling for an indicator parameter once continuous operation was initiated.

The surrogate and indicator parameters were to be chosen after some initial treatability testing. The chosen surrogate parameters for the monthly effluent sampling were the VOC organic fraction. The initial indicator for hourly monitoring was vinyl chloride measured using an on-site gas chromatograph. The design provides for automatic shutdown of the system if vinyl chloride is detected exceeding the MAC. In January 1999, EPA required that low concentration PAHs be added to the monthly effluent monitoring because low concentration PAHs had been detected exceeding the MACs during two previous quarterly influent samples. In a letter dated April 18, 2000, EPA approved discontinuation of the GC monitoring, but it was later reinitiated because it was helpful to assure compliance with the MAC during minor process revisions. EPA and Environ also agreed to add GC monitoring for methylene chloride, and later for 1,2-dichloropropane.

The monthly effluent monitoring for VOCs and PAHs appears to be sufficient. The Midco II treatment influent regularly exceeds the MAC for vinyl chloride, and periodically for other VOCs, including benzene, trichloroethylene, tetrachloroethylene and 1,1-dichloroethylene, and for certain PAHs. Other hazardous constituents have not exceeded the MACs in the influent since dieldrin was detected at 0.02 ug/l June and at 0.022 ug/l in September 2000, which exceeds the dieldrin MAC of 0.0126 ug/l.

Over time, EPA and Environ have come to trust the GC readings. However, Environ

staff have found that on hot days, a false methylene chloride detection is sometimes caused by migration of a GC peak for an unknown VOC into the retention time window for methylene chloride. This typically happens on hot sunny days when the sun beats down on the wall where the carrier gas cylinder is attached, and apparently increases the temperature from the morning calibration conditions. The occurrence of this peak migration is apparent from studying the GC output for the day. For this reason, when Environ determines that a shutdown is clearly caused by a false methylene chloride detection from GC peak migration, Environ has restarted the system without further testing.

The revised and expanded treatment system was tested for compliance with the MACs in a 3-day and 4-week test during February and March 2003. During these compliance tests, the number of UV lights used for treatment was reduced from the 11 previously used to 4. This reduced UV light usage was demonstrated to be effective for reducing VOCs below the MACs. However, certain PAHs exceeded the MACs in the effluent during June and July 2003. In response to these MAC exceedances, Environ returned to use of 11 UV lights.

The attached Table 8 provides a summary of shutdowns in response to apparent exceedances of the MAC in the Midco II effluent that has occurred since February 1996, including the results, and response actions. EPA has determined that the MRC has responded appropriately to each indication that the MAC was exceeded. However, the April 30, 2004 inspection by Weston identified that without providing notification to EPA, Environ again started operating Midco II using 4 UV lamps, and Environ operated the system for about a month without the GC. In response to this EPA sent a letter dated May 6, 2004 requesting Environ to notify EPA of changes in the approved operating conditions, and to report operating parameters including UV lamp usage and extraction well pumping rates in their Monthly Progress Reports.

Determining the Required Groundwater Capture Zone

The ROD requires that all portions of the Calumet aquifer affected by the Site or by Midco II operations that exceed the GWCALs must be recovered by the pump-and-treat system. The SOW required conducting groundwater sampling to define the full extent of hazardous substance migration. The attached Figure 4 identifies ERM's "estimated extent of hazardous substance migration", which was calculated by ERM by multiplying the number of years since Midco II started operating times an estimate of the groundwater velocity using groundwater gradients from the RI, a hydraulic conductivity of 8.76 feet/day, and assuming no retardation. Updated testing indicates that the hydraulic conductivity of the aquifer is better represented for design of the pump-and-treat system by 35 feet/day, which is approximately 4 times the estimate used by ERM. Therefore, a better estimate of the maximum distance of hazardous substance migration would be 4 times as far from the site as identified on Figure 4. Based on the March 1993 sampling results, EPA was concerned that Midco II contamination could

extend beyond the "estimated extent of hazardous substance migration", because of results exceeding the GWCALs in S-10, S-50, T-10, T-50, U-10, and U-50, and noted that many of the elevated contaminants were also detected on-site (see August 26, 1993 EPA letter).

To further evaluate whether the target capture zone is adequate this Review included evaluation of the groundwater contamination data from the *2002 Annual Ground Water Monitoring Report.* The most mobile contaminant group at is usually VOCs. The attached Table 9 presents the VOCs detected in downgradient boundary monitoring wells that exceeded the GWCALs in 2002 annual monitoring. Downgradient monitoring wells include: P-1; P-2; P-3; S-10; S-50; T-10; T-50; U-10; U-50; N-10; N-50; P-10; P-50; V-10; V-50; Q-10; and Q-50 (see Figure 5 for piezometer and monitoring well locations). As can be seen from Table 9, acetone, 2-butanone, benzene, and vinyl chloride were detected exceeding the MACs in certain downgradient boundary monitoring wells. All of these VOCs have been detected in very high concentrations in on-site groundwater. This indicates that the extent of groundwater capture should be extended beyond T-50, T-10, U-10 and N-10 to the east of Midco II. The VOC plume extends at least as far as P-3, where acetone was detected at 360 ug/l and 2-butanone at 37 ug/l, but the GWCALs were apparently not exceeded in the P-3 sample.[3] Based on this data, EPA has required that the capture zone extend at least to half way between the T cluster and P-3 from the T cluster and south to the N cluster.

Metals and cyanide contamination also exceed the GWCALs in certain downgradient boundary monitoring wells based on the 2002 sampling. This data is displayed and compared to the maximum detections in source area monitoring wells in the attached Table 10. Antimony, arsenic, barium, iron and selenium exceeded their GWCALs in a number of downgradient boundary monitoring wells. Table 10 shows that each of these metals except for antimony was also detected exceeding their GWCALs in source area monitoring wells. This indicates that the Site could be a source of the arsenic, barium, iron and selenium contamination. However, Table 10 also shows that the maximum concentrations of these metals are not significantly higher in the source area than in the downgradient boundary area. This indicates that the downgradient boundary wells are probably affected by an off-site or area-wide contaminant source. For this reason, EPA has decided that it is not necessary to extend the Midco II monitoring network and groundwater capture zone further east or south.

Achievement of the Required Groundwater Capture Zone

Between 1996 and 1998, ERM submitted a number of capture zone demonstrations to evaluate the extent of groundwater capture. The capture zone evaluations became

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[3] Because P-3 is screened throughout the depth of the Calumet aquifer detections concentrated in the lower or upper part of the aquifer may be diluted.

more sophisticated attempting to take precipitation and downtimes into account, but none were successful in demonstrating achievement of the target capture zone. In a letter dated February 24, 1998, EPA identified that Midco II was not achieving the design groundwater extraction rate of 26.2 gpm due to both an inability to consistently reach the design extraction rate and to an abundance of downtimes, and EPA required that the MRC submit a Corrective Action Report, consisting of a plan to increase the operating flow rate and to reduce downtimes. ERM submitted a corrective action report and corrective measures were implemented in 1998 and 1999 and resulted in achieving average groundwater extraction rates equal to the design rate.

In spite of the improved pumping rates, the capture zone evaluation conducted in September 1999 again failed to demonstrate the target capture zone was being achieved. At that point, EPA had Weston conduct groundwater modeling to evaluate capture. In a January 2000 modeling report, Weston found that the potentiometric surface plots that had been prepared by ERM were misleading because essentially all of the draw-down was based on extraction well water levels, which do not provide information on the width of the draw-down cone and are unreliable because of well inefficiencies. Furthermore, the hydraulic monitoring network was inadequate because hydraulic monitoring points were too far from the extraction wells to detect significant draw-down. Water level data demonstrated that the hydraulic conductivity of the aquifer was much greater than 8.77 feet per day used for design of the pump-and-treat system, but a precise range of hydraulic conductivity that fit the water level data could not be determined because the hydraulic monitoring points were too far from the extraction wells. Weston determined that the hydraulic conductivity must be greater than 35 feet per day. Weston also found that the ERM's estimated recharge rate of 18 inches per year appeared very high. Based on this evaluation, Weston recommended an increase in groundwater pumping rates, installation of additional extraction wells, installation of more piezometers near the extraction wells for hydraulic monitoring, and use of MODFLOW modeling software to interpret the water level data. EPA also required expansion of the monitoring system to include a number of outlying piezometers, P-1, P-2 and P-3, in order to detect potential off-site migration of contaminants.

In response to the deficiencies identified by Weston, ERM installed an additional 8 piezometers in August 2000, conducted pump tests in September 2000, and installed five more piezometers in April 2001. Following evaluation of the additional hydraulic data, the MRC and EPA agreed to an upgraded Midco II pump-and-treat system, including adding an extraction well (EW7), redistributing pumping, and increasing the total pumping rate to 50.6 gpm. The upgraded system started operation on 2/24/03. Based on Weston's modeling of water levels collected by Environ on 4/15/03, EPA determined that the expanded pump-and-treat system was achieving adequate groundwater capture. During the 2004 monitoring event and annually thereafter, a capture zone evaluation needs to be repeated and contaminant trends in boundary monitoring wells observed to evaluate whether the extent of groundwater capture is

adequate.

Groundwater Cleanup

Groundwater monitoring has been conducted annually to assess the progress of the groundwater cleanup. The 2002 annual monitoring, included collection of samples from 48 monitoring wells, piezometers and extraction wells. Although the SOW provides a criteria for temporarily removing monitoring wells from the annual sampling requirement, no monitoring wells have been temporarily removed and 2 piezometers were added starting in 2000 because of uncertainty about whether groundwater in the source area was being captured.

In order to reduce costs, from time to time EPA has approved relaxation of groundwater monitoring requirements. This has included:

- In January 1996, approval to discontinue groundwater monitoring for acetonitrile, methacrylonitrile, hexachloro-dibenzo-dioxin, and tin;
- In February 1998, EPA approved reducing the frequency of monitoring for semi-volatile organic compounds, polynuclear aromatic hydrocarbons, organophosphorus pesticides, chlorinated pesticides, PCBs, and herbicides from annually to triannually;
- In a May 10, 2001 letter, EPA approved delaying groundwater monitoring for semi-volatile organic compounds, polynuclear aromatic hydrocarbons, organophosphorus pesticides, chlorinated pesticides, PCBs, and herbicides until after soil remediation is performed, and every five years thereafter (however, EPA is requiring monitoring for these parameters in 2004 because they have not been monitored since 1997);
- In a January 12, 2004 letter, EPA waived the annual monitoring requirement for 2003 because of the extensive work being done on design of the soil treatment remedy during 2003.

Attached are Tables 11 and 12, which present the maximum VOC, SVOC, pesticides, low concentration PAHs, PCBs and inorganic contaminant detections from the RI data to the present. Table 11 provides the VOCs and inorganic data through 2002 (this is Table 5-6 from the *2002 Annual Ground Water Monitoring Report*). Table 12 provides the SVOCs, chlorinated pesticides, PCB, low level PAH, organophosphate pesticides, and herbicide data through 1997, which is the last year when these contaminants were analyzed (this is Table 5-3 from the 1997 Annual Groundwater Monitoring Report). Also attached is Table 13, which presents the VOCs and inorganic contaminants that contributed to GWCAL exceedances (this is Table 5-2 from the *2002 Annual Ground Water Monitoring Report*).

Observation of the trends in maximum detections of the most highly concentrated VOCs and cyanide indicate that there has apparently been a substantial decrease (greater than or approximately 10 X) in a number of contaminants since the RI or the

1993 pre-design investigation, including: methylene chloride; trans-1,2-dichloroethylene; trichloroethylene; benzene; 4-methyl-2-pentanone; and vinyl chloride. It is likely that these reductions are from biodegradation, as well as operation of the pump-and-treat system.

Other highly concentrated VOCs decreased less and are still at concentrations comparable to concentrations detected during the RI and predesign sampling in the most contaminated groundwater, including: acetone; 2-butanone; 1,1-dichloroethane; cis-1,2-dichloroethylene; 1,1,1-trichloroethane; cis-1,2-dichloropropane; toluene; ethylbenzene; xylenes; and cyanide. To some extent high detections of these compounds may reflect a shift to degradation products and the less degradable VOCs. However, toluene, ethylbenzene, xylenes and cyanide are normally very degradable in groundwater, and their continuing very high detections in certain monitoring wells may be the result of ongoing contaminant leaching from the highly contaminated soil in the source area. Treatment by SVE and air sparging, which is now scheduled to begin in 2004, should finally start to address this problem.

Observation of trends in the highest concentrations of metals do not indicate an obvious trend in antimony, arsenic, barium, iron, magnesium, or vanadium. The apparent decreases in copper, lead, nickel, selenium, thallium, and zinc are likely caused by improvements in sampling technique and not actual changes in groundwater conditions.

Observation of trends in the highest concentrations of SVOCs, pesticides, and PCBs does not indicate an obvious trend between the RI and the predesign sampling and the 1996 and 1997 samplings for phenol, 2-methylphenol, 4-methylphenol, 1,4-dimethylphenol, low concentration PAHs, pesticides or PCBs. There appears to be a substantial decrease for isophorone, 2-methylnaphthalene, acenaphthene, debenzofuran, fluorene, phenanthrene, anthracene, di-n-butylphthalate, pyrene, bis(2-ethylhexyl)phthalate, and 3-methylphenol. This decrease could be from a combination of degradation and improved sampling techniques.

According to the 2002 Annual Groundwater Monitoring Report, the following VOCs contributed to exceeding a GWCAL in source area monitoring wells during the 2002 monitoring: acetone; benzene; cis-1,2-dichloroethylene, 1,2-dichloroethane; 1,1-dichloroethylene; 1,2-dichloropropane; ethylbenzene; methylene chloride; 4-methyl-2-pentanone; toluene; tetrachloroethylene; trichloroethylene; 1,1,1-trichloroethane; vinyl chloride; and xylene. Detections of some VOCs in the most highly contaminated monitoring wells may be masked by higher concentration VOCs. It is believed that as the groundwater is cleaned up and VOC concentrations decrease that the VOC detection limits will improve. The following inorganics contributed to exceeding a GWCAL in source area monitoring wells during 2002: antimony; arsenic; barium; chromium, copper, cyanide; iron; manganese, nickel; and thallium. According to the *1997 Annual Ground Water Monitoring Report*, the following SVOCs, low concentration PAHs, pesticides and PCBs contributed to exceeding the GWCAL in source area

monitoring wells: aldrin; PCBs; benzo(b)flouranthene; benzo(a)pyrene; and dibenz(a,h)anthracene.

In 1997, the only direct injection VOCs, SVOCs, chlorinated pesticides, PCBs, low concentration PAHs, organophosphate pesticides or herbicides that contributed to exceeding a GWCAL in source area monitoring wells were: aldrin, low concentration PAHs, and PCBs in C10; and PCBs in C30.

In downgradient boundary monitoring wells, the following VOCs contributed to exceeding a GWCAL in 2002: acetone; benzene; 2-butanone;1,2-dichloroethane; and vinyl chloride (see previous section). The following inorganics contributed to exceeding a GWCAL in downgradient boundary monitoring wells in 2002: antimony; arsenic; barium; iron; and selenium.

In addition, chloroethane and beta-BHC exceeded their PRGs, and sulfide exceeded its PRG and Ambient Water Quality Criteria (AWQC) in source area monitoring wells (see Section VI).

Soil Treatment

From 1990 – 1991, EPA worked on developing a plan for a S/S treatability study. From 1992 – 1995, EPA and the MRC planned, performed and evaluated the results of a soil treatability study for S/S, in accordance with the SOW. The MRC had ERM arrange for testing to develop binders. In August 1993, the binders selected by ERM were submitted to a Weston subcontractor, who conducted the testing for achievement of the S/S performance standards. The results were reviewed by specialists for EPA and the MRC. It was concluded that the binders tested were not promising. Therefore, EPA conducted further planning, testing, and evaluation of results for S/S from 1995 – 1997. The testing included binders developed through recommendations of EPA staff and proprietary binders provided by a vendor. ERM provided support to collect soil for the testing, provided input into the planning documents, and provided input into the evaluation of results. Based on the results of this testing, EPA developed proposed revised performance standards for S/S, and revised criteria for determining the extent of soil treatment. These were proposed to the MRC in a draft ESD dated December 1997. In April 1998, ERM conducted soil sampling to determine the extent of soil treatment. From September 1998 – April 2000, EPA and the MRC discussed how to determine the extent of soil treatment.

In a February 22, 2000 letter, EPA agreed to delay implementation of soil treatment to allow the MRC to test chemical oxidation treatment of Midco I and Midco II source area soils. During 2000 and 2001, ERM prepared plans and conducted treatability testing for soil treatment by chemical oxidation. In letter reports dated June 18, 2001 and November 1, 2001, ERM summarized the results of the testing. ERM concluded that permanganate demand is extremely high making permanganate oxidation not cost

effective. Persulfate demand was also higher that usual and persulfate oxidation did not appear to be capable of oxidizing methylene chloride. For these reasons, chemical oxidation treatment of soils was not further considered.

During 2002, Environ and ERM, with EPA permission, conducted additional investigations and evaluations for an alternative soil treatment proposal and to test for other sources of contamination. The results of these investigations are summarized in the attached Table 14.

In October 2002, the MRC submitted a proposal for an alternative soil treatment remedy for Midco II, including conducting SVE on vadose zone soils, and air sparging on source area groundwater. On December 20, 2002, EPA approved proceeding with the SVE and air sparging design. On September 3, 2003, EPA approved the Design/Build Document for the SVE and air sparging. During November 2003, Environ conducted a pilot test for the SVE/air sparging system. The air sparging is not required in the ROD and goes beyond ROD requirements. Air sparging may reduce the time during which groundwater treatment by HP/UV will be required before deep well injection, and the time period achieving the GWCALs.

A ROD revision and Court approval will be required to change the ROD requirements relative to soil treatment by S/S. EPA and the MRC intend to proceed with work on resolving the remaining soil treatment issues as the SVE / air sparging system is constructed and operated.

Final Cover

The final cover will be designed and constructed after completion of the soil treatment.

V. Progress Since the Last Five-Year Review

Following is the protectiveness statement from the *Addendum to Five-Year Review Report Midco II, Gary, Indiana*, which was issued on 10/29/98:

"The remedy is considered protective in the short-term, because there is no evidence that there is current exposure. However, in order for the remedy to remain protective in the long-term, the following measures need to be taken:

- the pump and treatment system has to be improved so that it achieves the required capture zone;
- the sediment areas either have to be further excavated or filled-in with clean soil;
- the soil treatment and site cover phases have to be implemented."

Since the 1998 Five-Year Review, the access and deed restrictions on the site are still in place; the excavated sediments are still stored safely on-site under a flexible

membrane liner; and the pump-and-treat system has continued to remove VOCs from the Calumet aquifer and has continued to satisfy air emission and underground injection well requirements. However, there have not been large reductions in some VOC, metal or cyanide concentrations in the most highly contaminated source area monitoring wells. This may be because of continued contribution of contaminants from the source area soils. Implementation of SVE and air sparging should address this problem at least for VOCs.

The 1998 *Five-Year Review Report* noted that the pump-and-treat system was not achieving adequate groundwater capture. Since that time, EPA determined that the pump-and-treat system had been under-designed primarily because the hydraulic conductivity value used for the design was much too low. Some trends in VOC concentrations in downgradient boundary monitoring wells may indicate that VOCs had been migrating off-site from the source areas. In November 2002 – February 2003, the MRC expanded the pump-and-treat system. The expanded pump-and-treat system started operating in November 2003, and EPA determined that the expanded system is achieving an adequate groundwater capture zone.

The 1998 *Five-Year Review Report* also noted that contaminated sediments and soils exceeding the soil CALs was left in the ditch north of Midco II. The site fence was extended around these sediments, and a bypass pipe was constructed to direct flow in the ditch around the contaminated sediments. The site fence is preventing human contact with these soils, and the ecological risk will be evaluated and addressed during design of the final site cover. Because the soil treatment has not been completed, no progress has been made in further evaluating or addressing the ecological risk from the contaminated sediments and soils that were left in place. The *Addendum to the Five-Year Review Report* contains the following further explanation of the ecological risks from the soil sediment areas. This explanation is still valid.

"Midco II has an approximately 7 acre source area and is located in a heavily industrialized and urban area. The property is zoned industrial. Industrial Highway, which fronts the south side of the site is a major truck and traffic route. Sediment excavation is required along approximately 1300 feet of the ditch, which borders the north end of Midco II. The total area of excavation covers a total area of only about 1 acre. The ditch was apparently constructed in conjunction with adjacent railroad tracks, which border the north side of the site. A number of large industrial facilities and areas of relatively undisturbed wetlands lie north of the railroad tracks. The ditch also drains the north end of properties along Industrial Highway, which include a couple of junk yards and a number of closed small manufacturing facilities. The Gary-Chicago Airport lies south of Industrial Highway.

Although the elevated levels of arsenic and polyaromatic hydrocarbons remain in the unexcavated sediments, value of this area as an aquatic habitat is very low. EPA took this information (small affected area and small value as a habitat) into account in allowing the MRC to enclose the sediment area with a fence and divert the ditch water

around the contaminated sediment area as an interim measure. In addition, it will be less costly and more convenient for the MRC to further address the excavated areas in conjunction with construction of the final site cover than to conduct a special evaluation of the hazard and mobilize to take an action now."

Relative to the soil treatment, in 2000 – 2001, the MRC conducted a treatability study on using chemical oxidation, but the results were not favorable. In 2002, the MRC conducted further testing and evaluations, and submitted a proposal for an alternative to the ROD remedy for soils. In December 2002, EPA approved proceeding with the SVE and air sparging. In November 2003, the MRC conducted a pilot test for the SVE / air sparging system, and design of the full-scale SVE / air sparging system is now in progress.

VI. Five-Year Review Process

Administrative Components

Environ and Weston staff were notified of the initiation of the Five-Year Review process in September 2003. In February 2004, the RPM prepared a first draft of the *Second Five-Year Review Report* and distributed it to Region 5 Regional Counsel; Weston; Region 5 UIC Branch; Virginia Laszewski, Environmental Scientist, Region 5 Environmental Planning and Evaluation Branch; Donald Bruce, Chief Region 5 Remedial Response Section #6; and to Rosita Clark - Moreno, EPA Region 5 Five-Year Review Coordinator. After obtaining this input in March 2004, an updated draft of the *Second Five-Year Review Report* was distributed to Environ, IDEM, the City of Gary, and the Gary-Chicago Airport Authority for their review.

Community Notification and Involvement

Stuart Hill, EPA Region 5 Community Involvement Coordinator arranged to have a notification of the Review published in the October 8, 2003 edition of the Post-Tribune, which is a local newspaper. EPA received no public comments or inquiries in response to this notification. When the Review is completed, a notification and summary of results will be published in the same newspaper, and the *Second Five-Year Review Report* will be made available at the Gary Public Library.

During 1998 and 1999, Sally Swanson of EPA Region 5's Water Enforcement and Compliance Assurance Branch and Thomas Geishecker of EPA Region 5's Emergency Response Branch, participated in periodic meetings regarding expansion of the Gary-Chicago Regional Airport, which may impact Midco II. Other participants have included personel from the Gary-Chicago Airport Authority, the City of Gary, IDEM, the U.S. Fish & Wildlife Service, the U.S. Army Corps of Engineers, environmental groups, the MRC,

and other private parties. The RPM and the site attorney also attended one of these meetings. From 2002 to the present, EPA staff have been in communication with the Federal Aviation Administration, the Gary-Chicago Airport Authority, and other agencies regarding an environmental impact statement for expansion of the airport. Virginia Laszewski is EPA's primary reviewer for this environmental impact statement. She will be coordinating with the RPM regarding information on and the impact on Midco II.

Document and Data Review

A listing of the major documents and data used for this Review is in Attachment 2 to this report.

Interviews

During several site inspections, the RPM met with the Environ site operator and discussed operation of the treatment system. The Environ site operator also mentioned that he has had discussions with the recent purchaser of the junkyard property on the western border of Midco II. As previously mentioned, EPA staff have maintained contact with staff from the Gary-Chicago Airport Authority, and the City of Gary about the expansion of the Gary-Chicago Airport and what impact that may have on Midco II.

On-site inspections since last Five-Year Review

The Midco II site has been periodically inspected since the 1998 Five-Year Review. The attached Table 15 summarizes the results of these inspections.

VII. Technical Assessment

Question A: Is the Remedy Functioning as Intended by the Decision Document?

In general the answer to this question is yes for the access and deed restriction, and groundwater treatment portions of the remedy, but no for the sediment excavation and soil treatment portions because the soil remedy has not been completed. Access and deed restrictions on the site are in place as was provided for in the ROD. Sediments that have been excavated are stored safely on-site under a flexible membrane liner as provided for in the ROD.

The pump-and-treat system is operating and satisfying all air emission and underground injection well requirements. The pump-and-treat system now appears to be achieving adequate groundwater capture. This could be more definitively stated if a deep and shallow monitoring well cluster was installed near P-3. There has not been a large reduction in some VOC, metal or cyanide concentrations in the highly

contaminated source area monitoring wells. This may be because of continued contribution of contaminants from the source area soil.

When possible, measures have been taken to improve the performance and reduce costs for operation, maintenance and monitoring of the pump-and-treat system. This has included:

- Measures taken to reduce downtimes, and operation at above the design pumping rates to compensate for downtimes;
- Installation of a method to feed periodically hydrochloric acid into the deep well instead of conducting periodic well cleaning;
- Reduction in the frequency of groundwater monitoring for SVOCs, chlorinated pesticides, PCBs, low concentration PAHs, organophosphate pesticides, and herbicides;
- Reduction of data validation requirements.

As previously noted in Section IV, there is some concern about the pump-and-treat system meeting ROD requirements because of deficiencies in data validation, deficiencies in reporting of operational changes affecting compliance with the MACs, insufficient background groundwater data on some metals, potential for pulling off-site groundwater contamination into the area to be cleaned up, and uncertainty about the extent VOC groundwater contamination east if the site.

As previously explained, the ROD required that after the sediment excavation, soils in the in sediment areas should be below the soil CALs. However, the sediments that were left in place and some of the soil below the sediments that were excavated exceed the soil CALs. As an interim measure until the soil treatment is performed and site cap is constructed, these sediment areas have been enclosed in a fence and the ditch water diverted around the sediment area. The diversion of the ditch water prevents further downstream migration of contaminants in the sediments. The fence prevents human contact with the contaminants, but not necessarily contact by wildlife. However as explained in the *Addendum to Five-Year Review Report*, the wetlands affected are small in area and of low quality. For those reasons, it should be acceptable to delay the final action on these sediments until the site cover is constructed.

The soil treatment phase of the remedy has been delayed from what was anticipated at the time of the 1992 ROD Amendment, and SOW. However, the MRC has agreed to proceed with the SVE soil treatment (which is provided for in the ROD), and also to reduce VOC groundwater concentrations by air sparging (which goes beyond ROD requirements). The SVE / air sparging system is now in the process of being designed. Soil treatment by S/S is required in the ROD, and this requirement is still under discussion.

Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Objectives Used at the Time of the Remedy Selection Still Valid?

The remedial objectives used at the time of remedy selection as identified in Section IV of this report are still valid. There have been no changes in the physical conditions at the site that would affect the protectiveness of the remedy.

The inhalation toxicity factors, inhalation exposure assumptions, the MACs, soil CALs and GWCALs that presently apply to this cleanup were defined based on values, assumptions, criteria and standards that were available at the time of the 1992 ROD Amendment, or for a few contaminants at the time of ESD#1 and ESD#2 (except for MCLs which are updated when promulgated in accordance with the SOW). Many of these values, assumptions and standards have been updated since those times. In this review, data from the Region 9 PRG tables (as updated by more recent toxicity factors from EPA's Integrated Risk Information System (IRIS) for a few contaminants) and updated benchmarks used for screening for ecological risks, were used as screening tools to indicate whether there may be a need to update the inhalation toxicity factors, inhalation exposure assumption, MACs, GWCALs, or soil CALs in order for the remedy to be protective.

Question B for Air Emissions

The purpose of the 3 pound per hour limitation on emissions of VOCs as defined under the Clean Air Act is to reduce ozone formation on an area wide basis. This limitation has not become more stringent.

To limit potential human health risks from toxic air emissions during cleanup activities, the ROD provides that air emissions from each Midco II operation must not result in an a risk to a nearby resident or worker of more than CR = 10^{-7} or HI = 1.0. The 1992 ROD Amendment provides a generic procedure for calculation of CR and HI using defined exposure rate assumptions and toxicity factors. The toxicity factors were identified in the 1992 ROD Amendment for 36 VOCs, 24 SVOCs, 5 pesticides, and PCBs. It should be noted that the procedure for modeling emissions to obtain ambient air concentrations was not defined in the ROD.

Using a simple air model with the toxicity factors and exposure rate assumptions from the 1992 ROD Amendment, ERM calculated parameter specific action level emission rates and fugitive dust action levels for the groundwater treatment and sediment excavation (see the1993 Remedial Design / Remedial Action Work Plan). In 1999, ESD#2 added an inhalation toxicity factor for vinyl chloride and corrected the inhalation toxicity factor for chromium (VI). During design of the SVE / air sparging system, Environ will be performing modeling to evaluate compliance with the air emission criteria during the SVE / air sparging. EPA will review this modeling.

To screen whether the ROD toxicity factors and exposure rate assumptions (from the 1992 ROD Amendment as updated by ESD#2) are still protective, we compared the ROD inhalation carcinogenic potency factors (SF_i), the inhalation reference doses (RfD_i), and exposure rate assumptions to those used for calculation of the 2002 update of the PRGs (except the RfD_i for 4-methyl-2-pentanone, phenol and 1,4-dichlorobenzene are IRIS values, which were updated since 2002).

Comparison of the ROD inhalation exposure rate assumptions to those used for the PRGs demonstrates that the ROD assumptions are still protective. In fact, the exposure rate assumptions in the ROD are significantly more stringent than the exposure rate assumptions used for inhalation risks for the PRGs. For lifetime exposures used to evaluate carcinogenic risks, the ROD exposure assumptions are more than twice as stringent (8240 cubic meter air inhaled per kilogram body weight (m^3/kg) compared to 3800 m^3/kg using PRG exposure assumptions). For non-carcinogenic risks, the exposure to children (ages up to 6 years) is used, and the ROD exposure assumptions are approximately 40% more stringent (1980 m^3/kg compared to 1400 m^3/kg using PRG assumptions).

To evaluate toxicity factors, Table 17 compares ROD and PRG toxicity factors for contaminants whose toxicity factors are either new (that is available in the PRG tables but not in the ROD) or more stringent. Table 17 shows that many of the PRG SF_i and RfD_i are more stringent than the ROD toxicity factors, and many more SF_i and RfD_i are now available for contaminants that previously had none.

For the SVE / air sparging system, VOC emissions are the primary concern. The more stringent or new toxicity values for SVOCs, PAHs, pesticides and PCBs would have a minor impact on the SVE / air sparging air emission criteria because even though some of these contaminants (such as PAHs and PCBs) have a relatively high SF_i and have significant concentrations in on-site soils, their emission rates would be relatively low because of their low volatility compared to the VOCs. Based on their volatility and high concentrations in Midco II soils and groundwater, the lower or new RfD_i for the following VOCs would likely have the most significant impact on the HI from air emissions from the SVE system: acetone; 1,2-dichloropropane, ethylbenzene; 4-methyl-2-pentanone; tetrachloroethylene; toluene; trichloroethylene; and xylene. However, review of Table 6-16 from the Investigation and Monitoring Plan indicates that carcinogenic risks from VOCs will be the controlling or most stringent criteria for air emissions from SVE.

For this reason, the larger or new SF_i for the following carcinogenic VOCs would have the only significant impact on the emission limitations because of their high concentration in Midco IIsoil and groundwater (see Tables 6-2 and 6-3 of the Investigation and Monitoring Plan): 1,2-dichloropropane; ethylbenzene; trichloroethylene; and tetrachloroethylene. However, none of the SF_i for these VOCs have been finalized in IRIS. According to IRIS, 1,2-dichloropropane has not undergone a complete evaluation and determination under EPA's IRIS program for evidence of

human carcinogenic potential; ethyl benzene is placed in cancer classification D (not classifiable as to human carcinogenicity); tetrachloroethylene's carcinogenic assessment is not available at this time; and trichloroethylene's carcinogenicity assessment has been withdrawn. IRIS has never identified 1,2-dichlorpropane or ethylbenzene as carcinogens, and older SF_i for tetrachloroethylene and trichloroethylene were less stringent than the SF_i used for the PRGs. Because the *Comprehensive Five-Year Review Guidance* indicates that IRIS should be the primary reference used to assess protectiveness of toxicity factors (see Exhibit 4-2), EPA is not recommending that the SF_i be updated at this time. However, it would be a good idea to check emissions using the updated RfD_i to assure that the HI index is satisfied.

It should be noted that if all the SF_i are updated, air emissions limitations might not become more stringent, because the more stringent SF_i, and RfD_i for the contaminants in Table 16 may be balanced by a less stringent SF_i for vinyl chloride. Vinyl chloride is presently the most potent carcinogenic VOC listed in the ROD, but the updated SF_i, listed in IRIS (0.031) is less stringent by almost an order of magnitude than the ROD value (0.295). Although vinyl chloride was not detected in Midco II soils during the RI, it is present in the groundwater.

The fugitive dust emission calculations would not be significantly affected by the new or more stringent toxicity factors for VOCs and SVOCs because of the generally higher concentrations and SF_i of arsenic, chromium, and nickel in soils would result in arsenic, chromium, and nickel controlling the cancer risk (see Tables 6-7 and 6-18 of the Investigation and Monitoring Plan).

Question B for the MACs:

In addition to the protection to drinking water aquifers provided by the deep injection well location, monitoring and mechanical requirements, risks from the deep well injection are controlled by assuring that the groundwater is less than or equal to the MACs prior to deep well injection. In the 1992 ROD Amendment, the MACs were established for 183 hazardous constituents. The MACs were established at 6.3 times the then existing Health-Based Levels (HBLs), which were used for evaluating RCRA delisting petitions. Cumulative risks were not considered. The 6.3 factor provides a very conservative allowance for the protection provided by the location, monitoring and mechanical requirements of the deep well. If an MCL was available, the HBLs were set at the MCLs. Otherwise, the HBLs were set at the more stringent of CR = 10^{-6} or HI = 1.0 for residential water usage. The HBL for 1,1-dichloroethane was updated in ESD#1, and the HBLs for a number of carcinogenic PAHs were updated in ESD#2.

During preparation of the QAPP, the PSGWs were developed. The PSGWs include the TAL/TCLs, and additional hazardous constituents listed in 40 CFR § 261, Appendix IX, plus any other contaminants having GWCALs. The PSGWs excluded 15 contaminants having MACs because there was no reliable laboratory test for them. In addition, the

method detection limit of the approved analytical method for 31 of the hazardous constituents is greater than the MAC. EPA considers these 31 constituents to achieve the MACs if they are not detected even though the method detection limits exceed the MACs. These 46 hazardous constituents are not known to have been disposed on the Site, and EPA decided that it is not justifiable to go to the effort of developing special analytical methods for them when there were stringent MACs for many hazardous constituents known to be present in soil or groundwater at the Site.

The number of hazardous constituents routinely monitored for compliance with the MACs was further reduced because Appendix IX hazardous constituents that were not on the TAL/TCL and were not detected during the initial round of sampling were eliminated from further monitoring requirements. The end result is that 180 contaminants are routinely included in groundwater monitoring, including the annual groundwater monitoring, and monitoring for MAC compliance. This includes 129 hazardous constituents that have an assigned MAC, including 41 VOCs, 2 direct injection VOCs, 40 SVOCs, 8 low concentration PAHs, 13 chlorinated pesticides, PCBs, 4 organophosphate pesticides, 4 herbicides, 14 metals, cyanide, and fluoride. 51 contaminants are on the groundwater monitoring list that do not have assigned MACs, including 6 VOCs, 27 SVOCs, 8 chlorinated pesticides, 1 organophosphate pesticide, and 9 metals.

It should be noted that there are now MCLs for a number of contaminants that were not included in the PSGW. This includes:

- alachlor, atrazine, 2,4-D, dalapon, diquat, endothall, glyphsate, picloram and simazine, which are herbicides;
- carbofuran, which is a fumigant used on rice and alphalfa;
- oxamyl, which is an insecticide used on apples, potatoes and tomatoes; and
- di(2-ethylhexyl)adipate, which is used in making plastics including PVC films, as a plasticizer or solvent for cosmetics, and can be released from municipal waste incineration, and manufacturing plants including foundries and rubber manufacture.

EPA has determined that it is not necessary to add these contaminants to the PSGW for the following reasons:

- There is no evidence that these contaminants were disposed at the Site;
- According to an EPA consumer information fact sheet, (2-ethylhexyl) adipate will not leach through soil to groundwater and is broken down by microbes in the environment;
- The new herbicides, fumigant, and insecticide are unlikely to have been disposed at Midco II. The 1993 Work Plan provides for analysis of 30 pesticides and herbicides, and it is believed that these analyses are sufficient for these classes of contaminants.

In order to evaluate whether updated toxicity factors or standards indicate that the

MACs may no longer be protective, the existing HBLs were compared to the MCL or the PRGs for contaminants that do not have MCLs.[4] The attached Table 17 provides data on the 11 contaminants whose PRGs (or MCLs for contaminants that have them), are significantly more stringent than the existing HBLs.[5] Copper was also included in Table 18 because it has a new MCL and does not have an HBL. From review of Table 18, it is apparent that It would be unnecessary to update the MACs to 6.3 X PRG or MCL for 11 out of 12 of these contaminants (including copper) because the influent concentrations are already consistently less than 6.3 X PRG or MCL. Furthermore the MAC for the other contaminant (bis(2-chloroethyl)ether) can not be made more stringent because the present MAC is already well below the practical quantitation level (compare 0.189 to the 1 ug/l detection limit). For these reasons, it is not necessary to update the MACs to address updated toxicity factors and standards in order to assure that the deep well injection process will be protective.

Question B for the GWCALS

As described in the previous section it is not necessary to expand the groundwater monitoring analysis list to add contaminants that have new MCLs.

In accordance with the ROD Amendment, GWCALs are established at the lowest of the MCLs, the AWQC X 3.6, CR = 1 X 10^{-5}, and HI = 1.0, with the following exceptions:

- if an MCL is promulgated for a contaminant and that contaminant in a groundwater sample is the only one having a CR $\geq$ 1 X10^{-5}, then for that sample, the GWCAL for that contaminant defaults to the MCL or AWQC X 3.6 whichever is less, and that contaminant is not used in the CR calculation for that sample.
- if background concentrations or the lowest practical detection limit is less stringent than the lowest of these values, then the background concentration or

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[4] It was found that there are a four contaminants having HBLs whose HBLs can not be evaluated in this manner because they do not have MCLs or PRGs. These include: acetophenone; 7,12-dimethylbenz(a)anthracene (a PAH); famphur; and 3-methylcholanthrene (a PAH). According to the *1997 Annual Ground Water Monitoring Report*, these contaminants were either not detected in Midco II groundwater samples or were detected at low concentrations. Between March of 1998 and June of 2000, famfur was not detected in the influent, and the maximum acetonphenone detection has been 13 ug/l, which is very minor compared to its MAC of 25,200 ug/l. Therefore, the risks of deep well injection of famfur and acetophenone are very unlikely to be significant. Because the low concentration PAHs have similar toxicities, the PRGs for benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene) can be used to evaluate the protectiveness of the HBLs for 7,12-dimethylbenz(a)anthracene, and 3-methylchlolanthrene.

[5] According to Section 2.4 of the PRG instructions, EPA Region 9 and State of California toxicologists have agreed that the PRGs values are at best order-of-magnitude estimates. Therefore, only PRGs that are a factor of 0.3 (½ order of magnitude less using a logrithmic base 10 scale) or less than the HBLs are considered significantly more stringent (that is the HBL > 3.3 X PRG)

the detection limit become the GWCAL.

In accordance with the SOW, the MCLs are automatically added or updated when they are promulgated. For that reason, updates to toxicity values used to calculate CR are only relevant for contaminants that do not have MCLs, or if two or more contaminants contribute to a CR $\geq 1 \times 10^{-5}$.

In accordance with the SOW and ROD, the toxicity values for calculation of the CR and HI criteria were defined for 65 of the contaminants on the groundwater monitoring list including for 22 VOCs, 6 low concentration PAHs, 16 other SVOCs, 5 pesticides, 14 metals, cyanide, and PCBs. These were the contaminants of most concern at the site according to the RI. Exposure assumptions were also defined. The AWQC for calculation of the GWCALs were included in the SOW and ROD for 14 metals, 3 pesticides, pentachlorophenol, cyanide and PCBs.

ERM developed parameter specific GWCALs, which are shown in the attached Table 18 for VOCs and inorganic contaminants. The GWCALs take into account cumulative risks, but the parameter specific values can be used to determine whether toxicity factors or exposure assumptions have become more stringent. To evaluate whether the GWCALs will be protective to human health when they are achieved, the parameter specific GWCALs have been compared to adjusted PRGs. For carcinogenic compounds, the PRGs were adjusted to CR = 10^{-5} or to the HI = 1.0 if it is more stringent than the CR = 10^{-5}. For contaminants whose adjusted PRGs are significantly[5] more stringent than the GWCALs, this comparison is shown in the attached Table 20 along with the maximum groundwater detections from the most recent groundwater monitoring (2002 for VOCs and inorganic contaminants, and 1997 for other parameter groups). Table 20 also compares the PRGs to the maximum groundwater detections for contaminants on the groundwater monitoring list that do not have GWCALs, but do have PRGs.

Updating GWCALs to address more stringent toxicity values should be considered unnecessary to protect human health if: 1. groundwater concentrations are already consistently below what would be the more stringent GWCAL; 2. the existing GWCAL is already established at the lowest practical quantitation level or at background; 3. the existing GWCAL is still within an acceptable risk range.

Comparison of columns 3 and 4 of Table 19, shows that reason 1 applies to all of the groundwater monitoring contaminants that do not have GWCALs, except for chloroethane, n-nitrosopyrrolidine, beta-BHC, and hydrogen sulfide. Reason 1 also applies to nitrobenzene, which has a GWCAL.

Reason 2 applies to arsenic, 1,2-dibromoethane and vinyl chloride. It should be noted that the detection limits for the VOCs is generally 1 ug/l, 10 ug/l for direct injection VOCs, 5 ug/l for SVOCs, 0.01 – 0.02 ug/l for pesticides, 0.5 ug/l for organophosphorus

pesticides, and 0.4 – 2.0 ug/l for herbicides. However, detection limits are elevated in some of the highest contaminated samples, and, therefore, the presence of some contaminants may be masked by the higher concentration contaminants. However, it is expected that as the groundwater cleans up, the detection limits will improve.

Observation of Table 19 shows that the following contaminants could continue to present a risk at the GWCAL: acetone, ethyl benzene; toluene, tetrachloroethylene, trichloroethylene, xylene, 4-methylphenol, naphthalene, and manganese. The HIs for the following contaminants would exceed 1.0 at the GWCALs assuming that the PRGs are correct: acetone; xylene; 4-methylphenol, naphthalene, and manganese. The CRs for the following contaminants would exceed 1 X 10^{-4} at the GWCALs assuming the PRG CRs are correct: ethylbenzene; and trichloroethylene. It should be kept in mind that ethyl benzene, tetrachloroethylene, trichloroethylene, and xylene have MCLs, and that the MCLs may be applicable at the end of the remedial actions rather than the CR or HI. In addition, the PRGs for ethyl benzene, trichloroethylene, tetrachloroethylene, and 4-methylphenol utilized RfDs or SFs that have not been incorporated into IRIS.

The following contaminants that do not have GWCALs exceeded the PRGs: chloroethane; n-nitrosopyrrolidine; beta-BHC; and hydrogen sulfide. These contaminants may present a risk in groundwater if they are still present when the GWCALs are achieved.

In addition to the human health risks there is potential for the contaminated groundwater to cause an ecological risk by recharging the wetlands north of the site or the Grand Calumet River located approximately 1 mile south of the site. This concern was addressed in the ROD by settling the GWCALs equal to 3.6 times the AWQC, if this value was more stringent than the MCLs, the CR, and HI criteria. Since the time of the 1992 ROD Amendment, EPA ecologists have started to screen for ecological protection using benchmarks. To evaluate whether updated toxicity information may indicate that the GWCALs may not be protective of aquatic life, Table 20 provides a comparison of the ecological benchmarks derived from other projects multiplied by 3.9 (3.9 X Benchmark) with the GWCALs, and with the maximum groundwater concentrations. A benchmark was not available for all contaminants having GWCALs. As you can see from Table 20, the following contaminants are present at concentrations significantly exceeding 3.9 X Benchmark, and have 3.9 X benchmarks that are significantly[5] more stringent than the GWCALs: xylenes; barium; manganese; and zinc. It should also be noted that sulfide was detected at as high as 15,000 ug/l, which greatly exceeds its AWQC of 2 ug/l.

Considering these results, EPA has determined that a more detailed evaluation of the human health and ecological risks from the groundwater should be conducted sometime before the pump-and-treat system is shutdown. In the *Midco Conceptual Design Work Plan*, the MRC proposed revising the GWCALs related to the AWQC, and natural attenuation of groundwater outside the contained area. EPA provided

comments on the MRC's proposals. It appears that the most efficient time to conduct a more detailed evaluation of the human and ecological risks from the groundwater contamination would be during evaluations of the MRC's proposals.

Question B for Soil/Sediment CALs

Updated toxicity factors would not change the conclusion from the 1998 *Five-Year Review Report* that the soil CALs were not achieved in the ditch. The 1998 *Five-Year Review* identified that the soil/sediment CALs were exceeded for arsenic, carcinogenic PAHs, and lead in sediments left in place and in remaining soils where sediments where excavated (detections were as high as 146 mg/kg for arsenic, and 350 mg/kg for carcinogenic PAHs, and 630 mg/kg for lead). EPA identified analytical problems with the pesticide/PCB data collected during the sediment excavation, but during the RI chlordane was detected at as high as 15 mg/kg, and PCBs at as high as 34 mg/kg in portions of the ditch where sediments were not excavated. These arsenic, carcinogenic PAH, lead, chlordane and PCB concentrations exceed the 2002 residential soil PRGs and ecological benchmarks. Because updated toxicity factors and risk calculation methods would not result in changing the conclusion that the soil CALs were not achieved, and because the final remedy will result in treating and covering the contaminated sediments, the soil CALs do not need to be updated

Question B for STALs

Although calculation of the STALs utilize toxicity factors and risk-based calculations, the purpose of the STALs is to define the extent of soil treatment that would constitute the principal threat. For this reason assessment of the protectiveness of the STALs is not necessary.

Question C: Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

All known relevant information has been addressed in previous portions of this report.

Technical Assessment Summary

The access and deed restriction portion of the remedy are functioning as intended in the ROD. The groundwater pump-and-treat portion of the remedy is also functioning as intended in the ROD except for a few specific areas of concern. Some sediments from the ditch north of Midco II have been excavated and are being safely temporarily contained on-site. Sediments and soils remaining in the ditch still exceed the soil CALs, and action to fully address these risks are being delayed until the final site cover is constructed. In the meantime human access with these soils is restricted by a fence, and ecological risks are ongoing but are considered to be minor.

The soil treatment phase has been substantially delayed, but work on the SVE phase has been initiated. To enhance the effectiveness of the SVE, groundwater air sparging will be conducted. The air sparging goes beyond ROD requirements.

Many human health and ecological toxicity factors have changed, and this needs to be considered in evaluating the protectiveness of the groundwater cleanup.

VIII. Issues

ISSUE	AFFECTS CURRENT PROTECTIVENESS OF REMEDY? (Y/N)	AFFECTS FUTURE PROTECTIVENESS OF REMEDY? (Y/N)
1. Data quality problems identified in 10% validated data are not evaluated in the rest of the data.	N	Y
2. Changes in operation and monitoring of the of the pump-and-treat system affecting compliance with the MACs are sometimes not being reported to EPA.	Y	Y
3. Pump-and-treat system may be pulling in off-site contamination.	N	Y
4. Sediments and soils in ditch exceed soil CALs are temporarily enclosed in a fence	Y	Y
5. Defining the eastern boundary of the VOC plume	N	Y
6. Delay in soil treatment	N	N
7. Some toxicity factors and exposure assumptions for air emissions are out of date	N	N
8. Some MACs out of date	N	N
9. Some GWCALs out of date	N	Y
10. Some Soil CALs out of date	N	N

IX. Recommendations for Follow-Up Actions

ISSUE	RECOMMENTATIONS/ FOLLOW-UP ACTIONS	PARTY RESPO N-SIBLE	OVER-SIGHT AGENCY	MILE-STONE DATE	AFFECTS PROTECTIVE-NESS (Y/N) CUR.	FUTURE
1. Data Validation	Follow up on problems identified in 10% of data manually validated	MRC	EPA	4 / 8 / 04[6]	N	Y
2. Reporting of changes affecting MAC compliance	Notify EPA of changes, and include operating parameters in monthly progress reports	MRC	EPA	5 / 6 / 04[6]	Y	Y
3 Off-site contamination	Closely observe trends in boundary wells / better characterize off-site contamination, if necessary	MRC	EPA	Ongoing	N	Y
4. Sediment / Soil exceeds soil CALs	Implement soil treatment and final site cover	MRC	EPA	Ongoing	Y	Y
5. Eastern extent of VOC plume	Observe trends in P-3, and install additional monitoring wells if necessary	MRC	EPA	Ongoing	N	Y
6. Delay in soil treatment	Implement soil cleanup	MRC	EPA	Sched.[7]	N	N
7. Air toxicity factors / exposure assumptions	Not necessary				N	N
8. MACs	Not necessary				N	N
9. GWCALs	Update GWCALs	EPA		Future[8]	N	Y
10. Soil CALs	Not necessary				N	N

[6] EPA sent a letter to the MRC requiring corrective action.

[7] See Figure 12 of the *Soil Treatment Design/Build Report Alternative Remedy Revision 1.*

[8] It would be most efficent to evaluate and update the GWCALs when the MRC submits a request to shutdown the pump-and-treat system.

X. Protectiveness Statement

In summary, the access / deed restrictions and groundwater remedial actions at Midco II currently protect human health and the environment because contaminated groundwater from Midco II is being contained, because air emission and deep well injection requirements are satisfied, and because direct contact with the contaminated soils and groundwater is being prevented. However in order to assure that the remedy remains protective the following actions need to be implemented:

- improved notification and reporting of operating and maintenance problems affecting compliance with the MACs;
- more comprehensive data validation;
- closely observe trends in VOC concentrations along the east boundary of the monitoring well network , and metals concentrations in outer monitoring wells;
- install additional monitoring wells east of the site and better characterize off-site and background contamination, if necessary; and
- when evaluating a request for shutdown update the groundwater cleanup action levels if necessary.

The sediment excavation, soil treatment and site cover phases of the remedy are expected to be protective of human health and the environmental upon completion, and the interim exposure pathways that could result in unacceptable risks are being controlled.

XI. Next Review

The next five-year review for the Midco II site is scheduled five years from the date of this report.

Table 1 – Chronology of Events Midco II

EVENTS THROUGH REMEDY SELECTION	DATES
Ernest DeHart operated Midco II	1976 – 1977
Large drum fire at Midco I	12 / 76
Large drum fire at Midco II	8 / 77
EPA installed a fence around the site	1981
EPA removed all surface wastes (including thousands of drums, a number of tanks), and excavated and contained on-site sludge pit and filter bed.	1984 – 1985
Midco II added to the National Priorities List	6 / 10 / 86
Federal Court entered consent decree for a settlement between EPA and a group of generators to conduct an RII/FS and recover past costs	1985
Settling Defendants conducted RI/FS	1985-1989
EPA completed off-site disposal of excavated material from sludge pit and filter bed	1989
EPA issued Record of Decision (ROD)	6 / 30 / 89
EPA issued a unilateral administrative order requiring implementation of the ROD (the recipients did not obey the order)	11 / 89
EPA issued ROD Amendment	4 / 13 / 92
Federal Court entered Consent Decree for a settlement between EPA and a group of generators to implement the ROD, and recover past costs. The generators formed the MRC.	6 / 23 / 92
EVENTS FOR IMPLEMENTATION OF GROUNDWATER REMEDY	
MRC prepared and EPA reviewed RD/RA Project Plans, and Underground Injection Well Application Package	1992 – 1993
MRC constructed deep well	7 /93 –5 / 94
MRC constructed groundwater pump-and-treat system and underground pipeline from Midco II to Midco I	11 /94–3 /95
MRC conducted process optimization and initial testing for compliance of groundwater discharge with MACs	7 /95–12 /95
EPA issued an Explanation of Signficant Differences (ESD #1) to relax the MAC for 1,1-dichloroethane	1 / 9 / 96
MRC initiated continuous operation of the pump and treat system	2 / 22 / 96
MRC conducted groundwater capture zone evaluations	2 /96 – 9 /99
EPA required corrective actions to increase groundwater pumping rate to design rate	2 / 24 / 98
MRC evaluated and implemented corrective actions to increase groundwater pumping rates and reduce downtimes	3 / 98 – 1999

Continuation: Table 1 – Chronology of Events Midco II	
EPA issued first Five-Year Review	10 /29 / 98
EPA approved MRC's request to discontinue routine air monitoring for emissions from pump-and-treat system	11 / 12 / 98
EPA approved the MRC's Five-Year Underground Injection Well Re-Application Package	5 / 7 / 98
EPA issued ESD #2 to relax the MACs for certain polyaromatic hydrocarbons, to correct the inhalation carcinogenic potency factor of hexavalent chromium, and to add oral and inhalation carcinogenic potency factors for vinyl chloride	11 / 2 / 99
EPA determined that the pump-and-treat system was not achieving adequate groundwater capture because is was under-designed, and required re-evaluation of the design pumping rates.	12 / 23 / 99
MRC conducted additional hydraulic monitoring and evaluation of alternatives for improving groundwater capture	2000 – 2002
EPA issued Addendum to Five-Year Review Report	9 / 28 / 01
MRC constructed an expansion to pump-and-treat system, which EPA has determined achieves adequate groundwater capture	10 / 02 – 2 / 03
EVENTS FOR IMPLEMENTATION OF THE SOIL REMEDY	
EPA and MRC cooperatively worked on the initial soil S/S treatability study	1992 – 1995
MRC completed partial sediment excavation, sediment containment, and ditch diversion	9 /93 – 8,/94
EPA with sampling help from the MRC conducts second soil S/S treatability study	4/95 – 1/97
EPA proposed changes to the performance standards for soil treatment by soil vapor extraction and S/S, and to procedures to determine the extent of soil treatment	12 / 9 / 97
MRC conducted sampling to determine the extent of soil treatment	8 / 98
EPA and MRC discussed how to determine the extent of soil treatment by soil vapor extraction and S/S	9/ 98 – 4/ 00
EPA agreed to delay soil treatment in response to the MRC's request to conduct testing for chemical oxidation treatment of soils	2 / 22 /,00
MRC prepared plans for and conducted soil treatability study for chemical oxidation	2000 – 2001
MRC conducted additional investigations and evaluations for an alternative soil treatment proposal and to test for other sources of contamination	2002
MRC submitted proposal for an alternative soil treatment remedy, including use of soil vapor extraction, and groundwater sparging	10 / 02
EPA approved proceeding with the soil vapor extraction and groundwater sparging	12 / 20 / 02
MRC proceeded with design of the soil vapor extraction and groundwater sparging	3 / 03

Continuation: Table 1 – Chronology of Events Midco II	
EPA approved the Design/Build Document for soil vapor extraction and groundwater sparging	9 / 3 / 03
MRC conducted pilot study for soil vapor extraction and air sparging	11 / 03

Table 2 – Future Schedule Midco II

Event	Date
MRC will construct soil vapor extraction and air sparging system	10 / 03 – 9 / 04
MRC will intiate operation of soil vapor extraction and air sparging system	9 / 04
MRC must submit amended Underground Injection Well Application Package	11 / 7 /05

Table 3 – ROD Cleanup and Performance Requirements for Midco II

Component (Name of Requirement)	Applicability of Requirement	Requirements
Access and deed restrictions	Site access and property transactions	Six foot chain link fence with 3-strand barbed wire around site, and imposition of deed restrictions.
Sediment and soil excavation (sediment/soil cleanup action levels (CALs))	Excavation in defined sediment areas is required until CALs are met	CR = 10^{-6} ; HI = 1.0;[9] and lead = 500 mg/kg
Groundwater pump-and-treat (capture zone)	Extent of groundwater capture	All portions of the Calumet aquifer affected by Midco II that exceed the GWCALs.
Groundwater pump-and treat / ground-water cleanup action levels (GWCALs)	Pump-and-treat must continue until the GWCALs are achieved	MCLs ; CR = 10^{-5} for residential water usage; HI = 1.0; and AWQC X 3.6 (Parameter specific GWCALs for VOCs and inorganics are presented in the attached Table 18)
Deep well injection (location, monitoring and mechanical requirements)	The deep well must be located, constructed, tested, monitored and operated to meet these requirements	Requirements for Class I, non-hazardous injections wells identified in 40 CFR 144 Subparts A, B, D, and E, and 146 Subparts A,B and F, and in SOW
Deep well injection (Maximum Allowable Concentrations (MACs))	The extracted groundwater must not exceed the MACs prior to deep well injection	6.3 times the Health Based Levels (HBLs) used for RCRA delisting demonstrations in July 1991, except as changed by ESD#1 and ESD#2.[10] (MACs are presented in attached Table 21)
Soil treatment (minimum areas for treatment)	Soils within these defined areas must be treated by S/S and SVE	Areas and depths identified in a map in the 1992 ROD Amendment (total volume is approximately 5200 cubic yards)
Soil Treatment (soil treatment action levels (STALS))	Outside of defined minimum areas for treatment, if STALs are exceeded soil must be treated by S/S and/or SVE	CR = 5 X 10^{-4} assuming residential soil exposure; HI = 1.0; and lead = 1000 mg/kg.
SVE (performance standards)	Must be achieved in soil following completion of SVE	97% reduction in VOCs in treated soils

[9] The CR and HI are calculated assuming hypothetical lifetime residential exposure to soils having the sampling point concentrations.

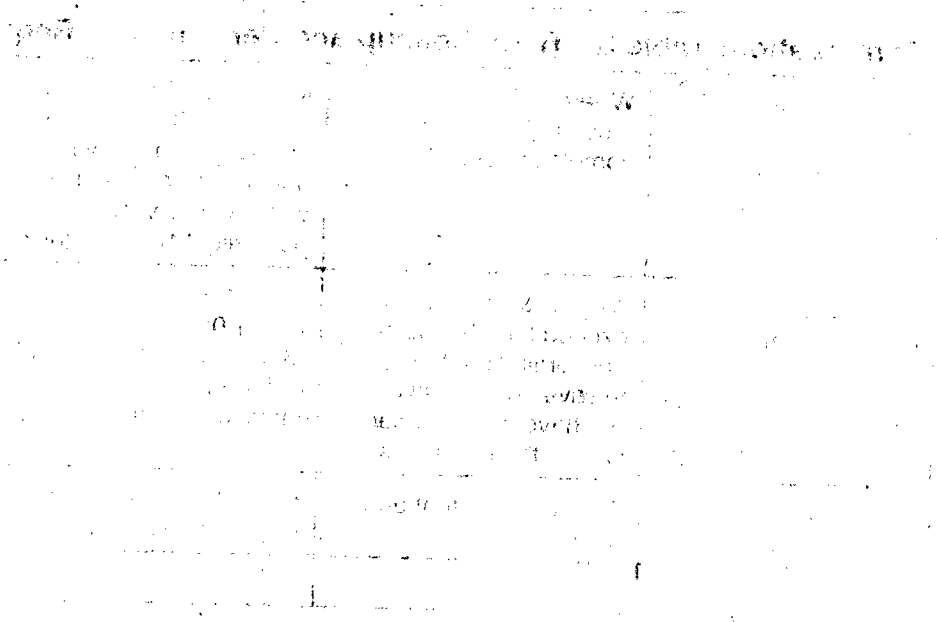
[10] By not exceeding the MACs the groundwater meets the equivalent of RCRA delisting requirements and is considered non-hazardous pursuant to RCRA.

Continuation: Table 3 – ROD Cleanup and Performance Requirements Midco II		
S/S (Minimum Performance Standards	Where S/S is required, must be achieved after completion of S/S	Metals≥90-99% reduction in mobility[11]; SVOCs ≥ 50% reduction[12]; hydraulic conductivity ≤ 10^{-7} cm/sec; unconfined compressive strength > 50psi; wet-dry durability < 10% weight loss; freeze-thaw durability <10% weight loss.
Air emissions (air emission criteria)	Air emissions must not exceed the pounds per hour limitation, the fugitive dust limitation, nor have the potential to cause the risk levels.[13]	CR = 1 X 10^{-7}; HI = 1.0; 3 pounds per hour of VOCs (Clean Air Act definition); Indiana Administrative Code 6-4 for fugitive dust
Final cover requirements	Final cover extent and quality	a multilayer cover over the entire site. Must meet requirements for RCRA Subtitle C landfill closure

[11] The reduction in mobility is measured by comparing before and after treatment results of the Synthetic Precipitation Leaching procedure (SW-846, Method 1312).

[12] The reduction refers to a comparison of the concentration in methylene chloride extract from soil before treatment to the concentration after treatment. The reduction criteria applies to the following compounds: anthracene, bis(2-ethylhexyl)phthalate, ethyl benzene, fluoranthene, naphthalene phenanthrene, phenol, toluene and xylene.

[13] The 1992 ROD provides that the CR and HI criteria applies to the nearest resident and workers on adjacent properties, but the SOW provides that it applies to a hypothetical resident located at the site boundary. These criteria apply separately to air emissions from each separate emission source, such as the groundwater treatment system, the S/S system, SVE, and excavation activities. The 3 pound per hour criteria applies cumulatively to all sources operating at the site at one time.



FIVE-YEAR REVIEW
TABLE 4

TABLE 3-2

PROJECT-SPECIFIC GROUND WATER (PSGW) FRACTIONS
WITH PROJECT-REQUIRED DETECTION LIMITS
MIDCO I AND II SITES
GARY, INDIANA

Parameters	Detection Limit (ug/l)	Parameters	Detection Limit (ug/l)
Volatile Organics			
Acetone	100	cis-1,2-Dichloroethene	5
Acetonitrile	200	trans-1,2-Dichloroethene	5
Acrolein	75	1,2-Dichloropropane	2.5
Acrylonitrile	34.7	cis-1,3-Dichloropropene	1.9
Allyl chloride (3-Chloropropene)	5	trans-1,3-Dichloropropene	1.6
Benzene	2.5	Ethyl benzene	5
Bromodichloromethane	1.86	Ethyl methacrylate	30
Bromoform (Tribromomethane)	2	2-Hexanone	50
Bromomethane	10	Iodomethane	5
2-Butanone (MEK)	20	Methacrylonitrile	10
Carbon disulfide	5	Methylene chloride (Dichloromethane)	5
Carbon tetrachloride	1	Methyl methacrylate	20
Chlorobenzene	5	4-Methyl-2-pentanone (MIBK)	5
Chloroethane	5	Propionitrile	34.4
Chloroform	1	Styrene	1
Chloromethane (Methyl Chloride)	10	1,1,1,2-Tetrachloroethane	5
Chloroprene (2-Chloro-1,3-butadiene)	10	1,1,2,2-Tetrachloroethane	0.5
Dibromochloromethane	2	Tetrachloroethene	2.5
1,2-Dibromo-3-chloropropane	4.4	Toluene	2
1,2-Dibromoethane (Ethylene dibromide)	1.6	1,1,1-Trichloroethane	5
Dibromomethane	5	1,1,2-Trichloroethane	0.5
1,2-Dichlorobenzene	10	Trichloroethene	3
1,3-Dichlorobenzene	5	Trichlorofluoromethane	5
1,4-Dichlorobenzene	5	1,2,3-Trichloropropane	5
trans-1,4-dichloro-2-butene	66.1	Vinyl acetate	5
1,1-Dichloroethane	2.38	Vinyl chloride	2
1,2-Dichloroethane	0.6	Xylenes (total)	5
1,1-Dichloroethene	1		
Direct Aqueous Injection Volatile Organics			
Dichlorodifluoromethane	30,000	Ethyl ether	30,000
1,4-Dioxane	28,200	Isobutanol	45,000
2-Ethoxy ethanol	25,000		
Methanol			45,000
Semivolatile Organics			
Acenaphthene	10	bis(2-chloroisopropyl)ether	10
Acenaphthylene	10	bis(2-ethylhexyl)phthalate	10
Acetophenone	10	4-Bromophenyl phenyl ether	10
2-Acetyleminofluorene	10	Butyl benzyl phthalate	5
4-Aminobiphenyl	10	4-Chloroaniline	5
Aniline	10	Chlorobenzilate	10
Anthracene	10	4-Chloro-3-methylphenol	5
Aramite	70	2-Chloronaphthalene	10
Benzo(k)fluoranthene	10	2-Chlorophenol	5
Benzoic acid	500	4-Chlorophenyl phenyl ether	10
Benzo(g,h,i)perylene	10	cis-Diallate	5.7
Benzyl alcohol	20	trans-Diallate	5.7
bis(2-chloroethoxy)methane	10	Dibenzofuran	10
bis(2-chloroethyl)ether	5.6	Di-n-butyl phthalate	10

TABLE 3-2

PROJECT-SPECIFIC GROUND WATER (PSGW) FRACTIONS
WITH PROJECT-REQUIRED DETECTION LIMITS
MIDCO I AND II SITES
GARY, INDIANA

Parameters	Detection Limit (ug/l)	Parameters	Detection Limit (ug/l)
Semivolatile Organic Compounds (continued)			
3,3'-Dichlorobenzidine	2.8	4-Nitroaniline	50
2,4-Dichlorophenol	5	Nitrobenzene	10
2,6-Dichlorophenol	10	2-Nitrophenol	5
Diethyl phthalate	5	4-Nitrophenol	20
p-Dimethylaminoazobenzene	10	4-Nitroquinoline-1-oxide	17.7
3,3'-Dimethylbenzidine	16.1	N-Nitrosodi-n-butylamine	5.0
a,a-Dimethylphenethylamine	27.4	N-Nitrosodiethylamine	4.8
2,4-Dimethylphenol	20	N-Nitrosodimethylamine	5.3
Dimethyl phthalate	5	N-Nitrosodiphenylamine	10
1,3-Dinitrobenzene	10	N-Nitrosodipropylamine	6.0
4,6-Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	50	N-Nitrosomethylethylamine	4.6
2,4-Dinitrophenol	50	N-Nitrosomorpholine	10
2,4-Dinitrotoluene	3.4	N-Nitrosopiperidine	4.6
2,6-Dinitrotoluene	4.0	N-Nitrosopyrrolidine	6.0
Di-n-octyl phthalate	10	5-Nitro-o-toluidine	10
Diphenylamine	10	Pentachlorobenzene	10
Ethyl methanesulfonate	6.0	Pentachloroethane	5
Fluoranthene	10	Pentachloronitrobenzene	10
Fluorene	10	Pentachlorophenol	18
Hexachlorobenzene	4	Phenacetin	23.6
Hexachlorobutadiene	2.9	Phenanthrene	10
Hexachlorocyclopentadiene	20	Phenol	10
Hexachloroethane	5	4-Phenylenediamine	83.9
Hexachloropropene	10	2-Picoline	5
Isodrin	10	Pronamide	10
Isophorone	10	Pyrene	10
Isosafrole	10	Pyridine	10
Kepone	100	Safrole	5.1
Methapyrilene	10	1,2,4,5-Tetrachlorobenzene	10
Methyl methanesulfonate	10	2,3,4,6-Tetrachlorophenol	50
2-Methylnaphthalene	10	Tetraethyl dithiophosphate (Sulfotepp)	40
2-Methylphenol	20	Thionazin	10
3-Methylphenol	20	2-Toluidine	7.2
4-Methylphenol	20	1,2,4-Trichlorobenzene	10
Naphthalene	10	2,4,5-Trichlorophenol	10
1,4-Naphthoquinone	10	2,4,6-Trichlorophenol	10
1-Naphthylamine	10	0,0,0-Triethylphosphorothioate	10
2-Naphthylamine	25	1,3,5-Trinitrobenzene	13.6
2-Nitroanaline	50		
3-Nitroaniline	50		
Polynuclear Aromatic Hydrocarbons			
Benzo(a)anthracene	0.001	Dibenzo(a,h)anthracene	0.0025
Benzo(b)fluoranthene	0.005	7,12-Dimethylbenz(a)anthracene	0.006
Benzo(a)pyrene	0.001	Indeno(1,2,3-c,d)pyrene	0.005
Chrysene	0.005	3-Methylcholanthrene	0.025

TABLE 3-2

PROJECT-SPECIFIC GROUND WATER (PSGW) FRACTIONS
WITH PROJECT-REQUIRED DETECTION LIMITS
MIDCO I AND II SITES
GARY, INDIANA

Parameters	Detection Limit (ug/l)	Parameters	Detection Limit (ug/l)
Chlorinated Pesticides/Polychlorinated Biphenyls			
Aldrin	0.01	Endrin	0.02
alpha-BHC	0.01	Endrin aldehyde	0.02
beta-BHC	0.01	Heptachlor	0.01
delta-BHC	0.01	Heptachlor epoxide (alpha, beta, gamma)	0.01
gamma-BHC (Lindane)	0.01	Methoxychlor	0.1
alpha-Chlordane	0.01	Toxaphene	1
gamma-Chlordane	0.01	Aroclor-1016	0.41
4,4'-DDD	0.02	Aroclor-1221	0.41
4,4'-DDE	0.02	Aroclor-1232	0.41
4,4'-DDT	0.02	Aroclor-1242	0.41
Dieldrin	0.005	Aroclor-1248	0.41
Endosulfan I	0.01	Aroclor-1254	0.41
Endosulfan II	0.02	Aroclor-1260	0.41
Endosulfan sulfate	0.02		
Organophosphate Pesticides			
Disulfoton	2	Parathion	10
Famphur	21.2	Phorate	2
Methyl parathion	0.5	Dimethoate	10
Herbicides			
2,4-D	30	2,4,5-TP (Silvex)	4
2,4,5-T	2	Dinoseb	1
Dioxins and Furans			
Hexachlorodibenzo-p-dioxins (total)	0.01	Tetrachlorodibenzo-p-dioxins (total)	0.01
Hexachlorodibenzofurans (total)	0.01	Tetrachlorodibenzofurans (total)	0.01
Pentachlorodibenzo-p-dioxins (total)	0.01	2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.005
Pentachlorodibenzofurans (total)	0.01		
Metals			
Aluminum	200	Magnesium	5000
Antimony	30	Manganese	50
Arsenic	10	Mercury	2
Barium	20	Nickel	50
Beryllium	2	Potassium	5000
Cadmium	4	Selenium	20
Calcium	5000	Silver	70
Chromium	10	Sodium	5000
Cobalt	10	Thallium	10
Copper	30	Tin	8000
Iron	100	Vanadium	40
Lead	10	Zinc	20
Sulfide			10000
Cyanide			40
Fluoride			1000
Chromium (VI)			10

FIVE YEAR REVIEW
TABLE 5

TABLE 1-1

LIST OF PARAMETERS ANALYZED AND DETECTION LIMITS
MIDCO I AND II SITES
GARY, INDIANA

Chemical	Detection Limit (µg/L)
Volatile Organic Compounds	
Chloromethane	1
Bromomethane	1
Vinyl chloride	1
Chloroethane	1
Methylene chloride	1
Acetone	5
Carbon disulfide	1
1,1-Dichloroethene	1
1,1-Dichloroethane	1
cis-1,2-Dichloroethene	1
trans-1,2-Dichloroethene	1
Chloroform	1
1,2-Dichloroethane	1
2-Butanone	5
Bromochloromethane	1
1,1,1-Trichloroethane	1
Carbon tetrachloride	1
Bromodichloromethane	1
1,2-Dichloropropane	1
cis-1,3-Dichloropropene	1
Trichloroethene	1
Chlorodibromomethane	1
1,1,2-Trichloroethane	1
Benzene	1
trans-1,3-Dichloropropene	1
Bromoform	1
4-Methyl-2-pentanone	5
2-Hexanone	5
Tetrachloroethene	1
1,1,2,2-Tetrachloroethane	1
1,2-Dibromoethane (Ethylene dibromide)	1
Toluene	1
Chlorobenzene	1
Ethylbenzene	1
Styrene	1
Xylenes (Total)	5
1,3-Dichlorobenzene	1
1,4-Dichlorobenzene	1
1,2-Dichlorobenzene	1
1,2-Dibromo-3-chloropropane (DBCP)	1
Direct Injection Volatile Organic Compounds	
1,4-Dioxane	10
Methanol	10
Semivolatile Organic Compounds	
Phenol	5
bis(2-Chloroethyl)ether	5
2-Chlorophenol	5
2-Methylphenol	5
2,2'-oxybis(1-Chloropropane)	5
4-Methylphenol	5
N-Nitroso-di-n-propylamine	5
Hexachloroethane	5
Nitrobenzene	5
Isophorone	5
2-Nitrophenol	5
2,4-Dimethylphenol	5
bis(2-Chloroethoxy)methane	5
2,4-Dichlorophenol	5
1,2,4-Trichlorobenzene	5
Naphthalene	5
4-Chloroaniline	5
Hexachlorobutadiene	5
4-Chloro-3-methylphenol	5
2-Methylnaphthalene	5

Chemical	Detection Limit (µg/L)
Semivolatile Organic Compounds	
Hexachlorocyclopentadiene	5
2,4,6-Trichlorophenol	5
2,4,5-Trichlorophenol	20
2-Chloronaphthalene	5
2-Nitroaniline	20
Dimethylphthalate	5
Acenaphthylene	5
2,6-Dinitrotoluene	5
3-Nitroaniline	20
Acenaphthene	5
2,4-Dinitrophenol	20
4-Nitrophenol	20
Dibenzofuran	5
2,4-Dinitrotoluene	5
Diethylphthalate	5
4-Chlorophenyl-phenylether	5
Fluorene	5
4-Nitroaniline	20
4,6-Dinitro-2-methylphenol	20
N-Nitrosodiphenylamine	5
4-Bromophenyl-phenylether	5
Hexachlorobenzene	5
Pentachlorophenol	20
Phenanthrene	5
Anthracene	5
Di-n-butylphthalate	5
Fluoranthene	5
Pyrene	5
Butylbenzylphthalate	5
3,3'-Dichlorobenzidine	5
Benzo(a)anthracene	5
Chrysene	5
bis(2-Ethylhexyl)phthalate	5
Di-n-octylphthalate	5
Benzo(b)fluoranthene	5
Benzo(k)fluoranthene	5
Benzo(a)pyrene	5
Indeno(1,2,3-cd)pyrene	5
Dibenz(a,h)anthracene	5
Benzo(g,h,i)perylene	5
Benzyl alcohol	5
Benzoic acid	25
Acetophenone	5
2-Acetylaminofluorene	10
Aramite	20
Chlorobenzilate	5
1,3-Dinitrobenzene	10
Diphenylamine	10
Isodrin	10
3-Methylphenol	20
N-Nitrosopyrrolidine	20
N-Nitrosomorpholine	5
Pronamide	5
2,3,4,6-Tetrachlorophenol	5
Polynuclear Aromatic Hydrocarbons	
Benzo(a)anthracene	0.11
Chrysene	0.040
Benzo(b)fluoranthene	0.048
Benzo(a)pyrene	0.075
Dibenzo(a,h)anthracene	0.13
Indeno(1,2,3-cd)pyrene	0.034
3-methylcholanthrene	0.090
7,12-dimethylbenz(a)anthracen	0.040

TABLE 1-1

LIST OF PARAMETERS ANALYZED AND DETECTION LIMITS
MIDCO I AND II SITES
GARY, INDIANA

Chemical	Detection Limit (µg/L)
Chlorinated Pesticides/PCBs	
alpha-BHC	0.010
beta-BHC	0.010
delta-BHC	0.010
gamma-BHC (Lindane)	0.010
Heptachlor	0.010
Aldrin	0.010
Heptachlor epoxide	0.010
Endosulfan I	0.010
Dieldrin	0.020
4,4'-DDE	0.020
Endrin	0.020
Endosulfan II	0.020
4,4'-DDD	0.020
Endosulfan sulfate	0.020
4,4'-DDT	0.020
Methoxychlor	0.10
Endrin ketone	0.020
Endrin aldehyde	0.020
alpha-Chlordane	0.010
gamma-Chlordane	0.010
Toxaphene	1.0
Aroclor-1016	0.20
Aroclor-1221	0.40
Aroclor-1232	0.20
Aroclor-1242	0.20
Aroclor-1248	0.20
Aroclor-1254	0.20
Aroclor-1260	0.20
Organophosphorous Pesticides	
Thionazin	0.50
Dimethoate	0.50
Methyl parathion	0.50
Famphur	0.50
Ethyl parathion	0.50

Chemical	Detection Limit (µg/L)
Herbicides	
2,4-D	2.0
2,4,5-TP (Silvex)	0.40
2,4,5-T	0.50
Dinoseb	2.0
Inorganics	
Aluminum	21.0
Antimony	1.0
Arsenic	2.0
Barium	20.0
Beryllium	1.0
Cadmium	1.0
Calcium	5,000
Chromium	1.0
Cobalt	1.0
Copper	1.0
Iron	50
Lead	1.0
Magnesium	5,000
Manganese	25
Mercury	0.20
Nickel	7.0
Potassium	5,000
Selenium	2.0
Silver	1.0
Sodium	5,000
Thallium	3.0
Vanadium	1.0
Zinc	1.0
Cyanide	10.0
Chromium (VI)	10
Sulfide (mg/L)	1.00

Table 6 – Results of Weston's Data Validation Audits

DATE	SAMPLES AUDITED	RESULTS
11 / 94	Midco II sediments	The audit determined that the large number of problems with the pesticide/PCB data contraindicated conclusion of ESI (MRC's data validation contractor) that the quality of the data was good. EPA concluded that the pesticide/PCB data was unuseable. The Weston reviewer believed that ESI reviewers were trying to avoid the appearance of antagonism by simply noting deficiencies without drawing the needed conclusions regarding the data useability. November 3, 1994 EPA letter,
10 / 95	24 -hour MAC compliance test for Midco II	The audit determined that the data validation was thorough and properly conducted.
2 / 96	24-hour MAC compliance test for Midco I, and 4-week test for Midco II	The audit determined that the validation was being properly conducted but identified improvement that could be made in both analyses and validation. See February 13, 1996 EPA letter.
9 / 96	Annual groundwater monitoring for Midco I and Midco II.	The audit determined that the data was reliable and validation was acceptable, and ESI was commended for addressing all correctable deficiencies in the laboratory data. See October 30, 1996 EPA letter.
3 / 97	4-week MAC compliance test for Midco I	The audit determined that the data was reliable and validation was acceptable, but Weston recommended that the laboratories SOPs be updated for PAHs, organophosphorus pesticides, and herbicides. See June 9, 1997 EPA letter
5 / 98	Air samples for Midco I	The audit determined tha the data was reliable and validation was acceptable. See 5/29/98 Weston letter.
2 / 00	Annual groundwater monitoring for Midco I and Midco II	The audit found that the data was reliable and the data validation was accurate and complete. See 3/23/00 EPA letter.
6 / 00	Annual treatment system influent and effluent samples collected on 11/22 and 12/15/99 for Midco I and Midco II	The audit found that the data was reliable and the validation was accurate and complete. See 6/29/00 EPA letter.

Table 7 – Influent and Effluent Low Level PAH Detections at Midco II from 3 / 99 – 3 / 00

DATE / BEFORE OR AFTER POST FILTERS	CONTAMINANT	INFLUENT CONC. (ug/l)	EFFLUENT CONC. (ug/l)
3/18 – 3/20/99	benzo(a)anthracene	0.068 – 0.11	< 0.014
	chrysene	0.48 – 0.75	< 0.036
before and after	benzo(b)flouranthene	0.034 – 0.084	< 0.022
	benzo(a)pyrene	0.045 – 0.096	< 0.016
	indeno(1,2,3-cd)pyrene	< 0.028 – 0.15	< 0.028
4/7/99	benzo(a)anthracene	0.869	< 0.014
	benzo(b)flouranthene	0.042	< 0.022
before and after	indeno(1,2,3-cd)pyrene	0.065	< 0.028
4/14/99	benzo(a)anthracene	0.13	< 0.014
	chrysene	0.85	< 0.035
before and after	benzo(b)flouranthene	0.34	< 0.021
	benzo(a)pyrene	0.14	< 0.016
	indeno(1,2,3-cd)pyrene	0.036	< 0.028
4/21/99	benzo(a)anthracene	0.28	< 0.013
	chrysene	1.6	< 0.034
before and after	benzo(b)flouranthene	0.35	< 0.021
	benzo(a)pyrene	0.2	< 0.015
4/28/99	benzo(a)anthracene	0.52	< 0.013
	chrysene	3.4	< 0.034
before and after	benzo(b)flouranthene	0.45	< 0.021
	benzo(a)pyrene	0.47	< 0.015
	dibenz(a,h)anthracene	0.060	< 0.026
	3-methylcholanthrene	0.047	< 0.034
	7,12-dimethylbenzanthracene	0.054	< 0.035
	indeno(1,2,3-cd)pyrene	0.11	< 0.027
6/29/99	benzo(a)anthracene	0.23	< 0.014
	chrysene	0.72	< 0.035
before	benzo(b)flouranthene	0.075	< 0.021
	benzo(a)pyrene	0.15	< 0.016
	dibenz(a,h)anthracene	0.035	< 0.026
9/28/98	benzo(a)anthracene	0.089	< 0.014
	chrysene	0.64	< 0.036
before	benzo(b)flouranthene	0.069	< 0.022
	benzo(a)pyrene	0.089	< 0.016
12/15/99	benzo(a)anthracene	1.3	< 0.013
	chrysene	6.3	0.033 – 0.043
before	benzo(b)flouranthene	1.1	< 0.021
	benzo(a)pyrene	1.7	< 0.015
	dibenz(a,h)anthracene	0.13	< 0.025
	3-methylcholanthrene	0.091	< 0.033

Continuation Table 7 – Influent and Effluent Low Level PAH Detections at Midco II from 3 / 99 – 3 / 00			
2/22/00 after	benzo(a)anthracene chrysene benzo(b)flouranthene benzo(a)pyrene dibenz(a,h)anthracene indeno(1,2,3-cd)pyrene	0.19 – 0.34 1.2 – 2.5 0.14 – 0.48 0.11 – 0.20 < 0.015 – 0.062 < 0.025 – 0.25	< 0.013 – < 0.014 < 0.033 – 0.12 < 0.021 – 0.097 < 0.015 – < 0.016 < 0.025 – 0.012 < 0.025 – 0.028
2/28 – 3/1/00 after	benzo(a)anthracene chrysene benzo(b)flouranthene benzo(a)pyrene dibenz(a,h)anthracene 7,12-dimethylbenzanthracene indeno(1,2,3-cd)pyrene	0.26 – 0.86 1.9 – 6.4 0.13 – 1.1 0.025 – 0.65 0.044 – 0.26 0.030 – 0.11 0.049 – 0.37	< 0.013 – < 0.027 < 0.013 – < 0.070 < 0.016 – 0.019 < 0.015 – 0.013 < 0.025 – 0.042 < 0.034 – 0.0036 < 0.025 – < 0.027
3/8/00 after	benzo(a)anthracene chrysene benzo(b)flouranthene benzo(a)pyrene dibenz(a,h)anthracene	0.25 0.62 0.36 0.17 0.075	< 0.014 < 0.036 – 0.0091 < 0.022 < 0.016 < 0.027
3/15/00 after	benzo(a)anthracene chrysene benzo(b)flouranthene benzo(a)pyrene dibenz(a,h)anthracene 7,12-dimethylbenzanthracene indeno(1,2,3-cd)pyrene	0.60 4.0 0.70 0.48 0.18 0.099 0.27	< 0.013 0.02 – 0.12 < 0.020– 0.026 < 0.015 < 0.025 < 0.027 – 0.0018 < 0.025
3/22/00 after	benzo(a)anthracene chrysene benzo(b)flouranthene benzo(a)pyrene dibenz(a,h)anthracene 7,12-dimethylbenzanthracene	0.33 1.9 0.40 0.14 0.027 0.039	< 0.015 – 0.00099 < 0.033 – < 0.089 < 0.02 – 0.017 < 0.015 < 0.025 < 0.034
3/29/00 after	benzo(a)anthracene chrysene benzo(b)flouranthene benzo(a)pyrene dibenz(a,h)anthracene indeno(1,2,3-cd)pyrene	0.36 0.87 1.0 0.37 0.024 0.1	< 0.014 – 0.0029 < 0.034 – < 0.07 < 0.021 – 0.024 < 0.015 – 0.0016 < 0.026 – 0.0030 < 0.027 – < 0.028

Table 8 – Summary of Shutdowns in Response to Exceedances of th MAC in the Midco II Effluent

DATE	OCCURENCE	RESPONSE
5/19-20 /1996	MAC exceeded for vinyl chloride[14]	Approximately 17,000 gallons of untreated groundwater was pumped from Midco II into 3-mile pipeline from Midco I to Midco II and into deep well. However, little if any reached the uncased portion of the deep well. The untreated groundwater was pumped back to Midco II, the piping flushed with clean water, and the returned water stored an Baker tanks and treated.
1/26/99	MAC exceeded for dibenzo(a,h)-anthracene [15]	Treatment system shutdown on February 10. The MRC installed a 1 micron filter between the prefilters and the HP/UV unit. The 1-day and 3-day tests completed. The system was restarted for continuous operation on April 1 and the four week test completed. In the samples collected for the compliance verification testing in March and April 1999, no PAHs were detected in samples collected either before or after the post-filter.
1/6/00	MAC exceeded for benzo(b)flour-anthene, and 1,12-dimethyl-benz-anthracene[16]	Treatment system shutdown on 2/7/00. Samples collected on 2/7/00 demonstrated a reduction in PAHs to below the MACs after the post filter. 1-day test performed, system started continuous operation on 2/28/00 and 3-day and 4-week tests conducted. It was agreed that future effluent sampling would be after the post filter.
1/28/02	MAC exceeded for vinyl chloride detected in GC monitoring	It was determined that following change-out of pre- HP/UV filters, a slug of cloudy water can inhibit HP/UV treatment for a few minutes. The MRC made it a policy to place the HP/UV system in the cleaning cycle after replacing filters, and conducted gas chromatograph sampling for vinyl chloride and methylene chloride every 15 minutes from 2/26 until 3/20. During the cleaning cycle, HP/UV effluent is recirculated back to the filters for 8 minutes – long enough for a slug of cloudy water to be filtered.
4/10/02	MAC exceeded for 1,2-dichloro-propane[17]	The system was not turned off because the MAC was not exceeded in the subsequent monthly effluent sampling. The MRC prepared a report dated August 1, 2002 on operating conditions at the time of the MAC exceedance. The MRC added 1,2-dichloropropane to the gas chromatograph analyses starting in August 2002.

[14] Vinyl Choride was detected at 38 ug/l in the equalization tank before the deep well injection. This is compared to the MAC of 12 ug/l. UV/HP had shutdown while operators were away and automatic shutdown tied to GC readings was accidently turned off.

[15] Dibenzo(a,h)anthracene was detected at 0.0094 ug/l detected compared to the MAC of 0.0044). However, the detection did not exceed the MAC for dibenzo(a,h)anthracene of 0.069 ug/l as revised in ESD#2.

[16] Benzo(b)flouranthene was detected at 0.6218 ug/l compared to the MAC of 0.45 ug/l, and 1,12-dimethylbenzanthracene was detected at 0.0288 ug/l compared to the MAC of 0.019 ug/l.

[17] 1,2-dichloropropane was detected at 43 ug/l compared to the MAC of 31/5 ug/l.

Continuation Table 8 – Summary of Shutdowns in Response to Exceedances of th MAC in the Midco II Effluent		
6/24/03-7/17/03	MAC exceeded for 7,12-dimethyl-benz-anthracene, and 3-methylchol-anthrene[18]	The system was not shutdown because none of the MACs were exceeded in the August effluent sampling. Environ increased UV usage from 6 to 11 UV lamps.
7/4/03	Methylene chloride exceeded MAC according to GC	Environ determined that the shutdown was caused by a false methylene chloride detection caused by migration of an unknown GC peak. The migration may be caused by heating of the argon gas cylinder following daily calibration. The system was restarted.

Table 9 – VOC Detections Exceeding a GWCAL in Downgradient Boundary Monitoring Wells in 2002

VOC	WELL #	RESULT (ug/l)	GWCAL (ug/l)
Acetone	T-50	9,100	3,240
2-Butanone	T-50	3,100	588
Benzene	T-10 U-10	4 12	2.69
Vinyl chloride	N-10	3	2.2

[18] 7,12-dimethylbenzanthracene was detected at 0.0499 ug/l on 6/24/03 compared to the MAC of 0.019 ug/l. 3-methylcholanthrene was detected at 0.0438 ug/l on 6/24/03, and at 0.26 ug/l on 7/17/03 compared to the MAC of 0.019 ug/l.

Table 10 – Metal Detections Exceeding a GWCAL in Downgradient Boundary Monitoring Wells in 2002, and Comparison to Maximum Detection in Source Area Monitoring Wells (results and GWCALS are in ug/l)

METAL	WELL #	RESULTS IN BOUNDARY WELLS	MAX. DETECTIONS IN SOURCE AREA WELLS	GWCAL
Antimony	P-50 Q-10 Q-50	6.2 11.7 18.2	3.5 (C-30)	6
Arsenic	N-10 N-50 P-50 Q-50 S-10 S-50 T-10 T-50 U-10 U-50 V-50 P-1 P-2 P-3	22.0 72.7 70.0 67.0 22.0 92.9 15.4 63.6 29.0 59.2 63.9 35.5 21.8 34.9	95.7 (MW-4D) 71.3 (D-30)	15.1
Barium	N-50 Q-50 S-50 T-50 V-50 P-3	1,820 4,150 1,950 5,470 3,840 1,810	7,630 (MW-50) 3,600 (MW-4D)	1,620
Iron	N-50 P-50 Q-50 U-10 U-50 V-50 P-3	73,900 36,100 26,800 37,500 43,700 49,800 27,500	40,500 (MW-50) 22,100 (R-10)	15,300
Selenium	S-10	83.8	65.2 (H-10) 3.4 (MW-2S)	50

FIVE-YEAR REVIEW
TABLE II

TABLE 5-6

SUMMARY OF THE TARGET COMPOUND LIST/TARGET ANALYTE LIST RESULTS AND COMPARISON WITH PREVIOUSLY COLLECTED DATA(1)
MIDCO II SITE GARY, INDIANA
(Page 1 of 2)

	2002 Annual Ground Water Monitoring			2001 Annual Ground Water Monitoring			2000 Annual Ground Water Monitoring			1999 Annual Ground Water Monitoring			1998 Annual Ground Water Monitoring			1997 Annual Ground Water Monitoring		
Parameter	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration
Volatile Organic Compounds																		
Chloromethane				4/41	12 J	E-10	4/41	0.3 J	P-2							1/38	14 J	C-30
Bromomethane	1/41	2 J	MW-4D													1/38	2 J	C-30
Vinyl chloride	6/41	3	N-10	10/41	50 J	E-10	5/41	7	MW-1	1/38	0.9 J	N-10	1/38	9 J	MW-1	10/38	950 J	F-10
Chloroethane	3/41	52 J	E-10R	2/41	33 J	E-10	4/41	11 J	B-30									
Methylene chloride	6/41	90 J	F-30	1/41	2 J	G-30	1/41	78 J	F-30							2/38	480	R-50
Acetone	8/41	9,100	T-50	10/41	19,000 J	T-50	12/41	16,000 J	T-50	7/38	41,000 J	S-50	4/38	3,000 J	B-30	2/38	36,000 J	S-50
Carbon disulfide	17/41	0.7 J	N-10	17/41	30 J	E-50	2/41	0.1 J	MW-50, H-30							2/38	0.1 J	G-10, Q-10
1,1-Dichloroethene	2/41	0.6 J	MW-1/MW-4D	1/41	0.2 J	B-10	1/41	1	MW-1									
1,1-Dichloroethane	8/41	200 J	R-10	5/41	52 J	F-10	7/41	170 J	F-10	1/38	0.6 J	MW-4S	4/38	48 J	B-10	8/38	600 J	R-10
cis-1,2-Dichloroethene	13/41	1,100 J	R-10	8/41	1,900 J	R-10	9/41	2,100 J	R-10	3/38	100	MW-10	5/38	480 J	E-10	10/38	2,800	F-10
trans-1,2-Dichloroethene	3/41	4	MW-1	2/41	0.5 J	G-10	2/41	2	MW-1				1/38	44 J	B-10	2/38	220	B-10
Chloroform													2/38	1 J	B-30	1/38	1 J	C-30
1,2-Dichloroethane	4/41	2	D-10	1/41	3	G-10										4/38	0.4 J	MW-4D, G-10, G-30
2-Butanone	4/41	4,600 J	MW-4D	11/41	6,000 J	T-50	6/41	5,300 J	T-50	2/38	9,500 J	S-50	2/38	44 J	B-30	4/38	6,300 J	S-50
Bromochloromethane	1/41	0.7 J	MW-4D				3/41	0.8 J	D-10									
1,1,1-Trichloroethane	2/41	680 J	R-10	2/41	1600 J	R-10										2/38	1,900 J	R-10
Carbon tetrachloride																1/38	1 J	C-30
Bromodichloromethane													1/38	0.2 J	MW-2S			
1,2-Dichloropropane	2/41	34 J	E-10R	4/41	61 J	F-10	1/41	0.2 J	MW-1	1/38	8	D-10	1/38	15	D-10	3/38	1,600 J	R-10
cis-1,3-Dichloropropene							4/41	1 J	V-50									
Trichloroethene	6/41	250 J	MW-1	4/41	65	MW-1	5/41	24	MW-1	2/38	370 J	R-10	2/38	380	MW-1	6/38	1,000 J	R-10
Dibromochloromethane							2/41	0.8 J	D-10									
1,1,2-Trichloroethane				1/41	0.2 J	G-10										1/38	0.8 J	G-10
Benzene	12/41	110 J	R-10	9/41	110	E-10	12/41	75	D-10	4/38	42	C-10	5/38	75	C-10	10/38	650 J	R-10
trans-1,3-Dichloropropene							2/41	0.2 J	MW-3S, U-50									
4-Methyl-2-pentanone	12/41	4,300	F-30	17/41	10,000 J	R-10	8/41	2,500	F-30	12/38	9,200 J	E-10R	9/38	2,600 J	R-50	10/38	12,000 J	R-10
2-Hexanone							1/41	1 J	MW-4D									
Tetrachloroethene	4/41	110 J	R-10	3/41	1	G-10	2/41	0.3 J	MW-1				1/38	0.2 J	MW-2S	1/38	6	G-10
Toluene	19/41	50,000	R-10	11/41	77,000	R-10	7/41	51,000	R-10	6/38	22,000	R-10	9/38	100,000	R-10	4/38	96,000	R-10
Chlorobenzene	3/41	0.6 J	MW-4D/B-10	2/41	0.9 J	MW-1 / B-10	2/41	1	B-10	1/38	2 J	B-10	1/38	0.3 J	MW-2S	2/38	14 J	B-10
Ethyl benzene	12/41	12,000	R-10	10/41	17,000	R-10	15/41	12,000	R-10	9/38	8,700	E-10R	10/38	17,000	R-10	10/38	20,000	R-10
Styrene													2/38	100 J	G-10			
Xylenes (Total)	17/41	36,000	R-10	10/41	49,000	R-10	16/41	31,000	R-10	10/38	36,000	E-10R	10/38	49,000	R-10	11/38	56,000	R-10
1,3-Dichlorobenzene	1/41	0.2 J	P-2	1/41	0.8 J	V-50										1/38	0.3 J	MW-4D
1,4-Dichlorobenzene	2/41	0.4 J	MW-1				1/41	2	MW-1									
1,2-Dichlorobenzene	2/41	27 J	MW-1	7/41	94	MW-1	1/41	180	MW-1	2/38	120	MW-1	1/38	110	MW-1	1/38	18 J	MW-1
1,2-Dibromo-3-chloropropane							1/41	2000 J	R-10									
1,2,4-Trichlorobenzene				2/41	0.6 J	U-10							1/38	0.40 J	MW-2S			
Inorganics																		
Aluminum	12/41	1,740	P-50	11/41	2,010	P-50	10/41	1,480	P-50	6/38	6,090	P-50	16/38	4,250	P-50	19/38	20,600	R-50
Antimony	12/41	18.2	Q-50							1/38	1.8 J	MW-4S				4/38	32.4	MW-50
Arsenic	33/41	95.7	MW-4D	37/41	89.3	S-50	38/41	88.5	MW-4D	35/38	104	S-50	27/38	93.4	S-50	33/38	91.3	MW-4D
Barium	41/41	7,630	MW-50	41/41	7,600	MW-50	41/41	10,800	MW-50	38/38	10,000	MW-50	38/38	9,450	V-50	38/38	10,300 J	V-50
Beryllium	2/41	0.70 J	E-10R													1/38	1.0	E-50
Cadmium	20/41	2.1 J	P-3	2/41	2.8 J	MW-50	17/41	1.9	G-10	36/38	6.5	MW-50				4/38	4.3	G-30
Calcium	40/40	559,000 J	V-50	41/41	648,000	V-50	41/41	628,000	MW-50	38/38	716,000	P-50	38/38	748,000	P-50	38/38	659,000	P-50
Chromium	41/41	219	H-30	33/41	544	Q-50	40/41	233 J	H-30	38/38	473	G-30	38/38	595	G-30	34/38	227 J	H-30
Cobalt	28/41	84.7	T-50	27/41	104	S-50	34/41	150	S-50	31/38	238	S-50	29/38	218	S-50	14/38	153	S-50
Copper	22/41	191	G-10	28/41	231	G-10	14/41	286	G-10	26/38	486	G-10	22/38	245	G-10	13/38	607	G-10
Iron	41/41	73,900	N-50	39/41	77,100	N-50	39/41	73,700	N-50	37/38	66,300	N-50	37/38	58,600	N-50	38/38	59,600	N-50
Lead	7/41	8.1	H-30	3/41	9.5	R-10				5/38	93.6	C-10	18/38	55.0	C-10	7/38	29.6	R-50
Magnesium	40/40	603,000	D-10	41/41	613,000	D-10	41/41	845,000	D-10	38/38	647,000	D-10	38/38	551,000	D-10	38/38	627,000 J	D-10
Manganese	41/41	2,820	U-10	41/41	3,460	U-10	41/41	6,860	V-10	38/38	3,990	R-10	38/38	2,740	U-10	38/38	1,960	U-10
Mercury										1/38	0.05	R-50	1/38	0.11	S-10			
Nickel	41/41	284	G-10	37/41	516	R-10	40/41	707	R-10	38/38	1,770	R-10	34/38	1,030	R-10	29/38	1,060	R-10
Potassium	40/40	14,200,000	B-30	41/41	12,800,000 J	B-30	41/41	14,300,000	B-30	38/38	16,300,000	B-30	38/38	13,300,000 J	B-30	38/38	14,800,000	B-30
Selenium	13/41	83.8	S-10	7/41	20.4	H-10	3/41	118	S-10	16/38	66.1	S-10	8/38	16.0 J	S-10	4/38	36.8 J	S-10
Silver				3/41	1.2	MW-50/H-30/P-1	1/41	0.95	T-50							1/38	1.2	E-10
Sodium	41/41	13,100,000	B-30	41/41	12,700,000	B-30	41/41	13,100,000	B-30	38/38	14,000,000	B-30	38/38	13,700,000	MW-4D	38/38	13,000,000	B-30
Thallium	3/41	4.2 J	D-30	2/41	6.1	F-10				5/38	6.1 J	MW-4S				3/38	4.3	C-30
Vanadium	28/41	320	S-10	17/41	53.5	S-10	32/41	180	S-10	34/38	264	G-10	10/38	160	S-10	9/38	246	S-10
Zinc	33/41	287	U-10	22/41	361	U-10	9/41	436	G-10	13/38	950	G-10	18/38	294	G-10	17/38	424	G-10
Cyanide	29/41	9.500	MW-1	37/41	563	MW-1	34/41	391	MW-4S	28/38	3,630	MW-1	15/38	1,160	MW-1	13/38	1,940 J	R-10
Chromium (VI)	2/23	30	Q-50/S-10	7/41	22	D-10				5/38	20	U-10,R-10,MW-3D						

Key:

J= Estimated value

N= Parameter did not meet all of the United States Environmental Protection Agency's defined identification criteria

(1) Blank spaces denote that the parameters were below their respective laboratory quantitation limits, the data were rejected, or the parameters were not analyzed (1986-87 Remedial Investigation only).

TABLE 5-6

SUMMARY OF THE TARGET COMPOUND LIST/TARGET ANALYTE LIST RESULTS AND COMPARISON WITH PREVIOUSLY COLLECTED DATA(1)
MIDCO II SITE GARY, INDIANA
(Page 3 of 2)

	1996 Annual Ground Water Monitoring			1993 Predesign Investigation			1986-87 Remedial Investigation	
Parameter	*Frequency of Detection*	*Highest Detected Concentration (ug/L)*	*Location of Highest Detected Concentration*	*Frequency of Detection*	*Highest Detected Concentration (ug/L)*	*Location of Highest Detected Concentration*	*Highest Detected Concentration (ug/L)*	*Location of Highest Detected Concentration*
Volatile Organic Compounds								
Chloromethane	1/38	0.9 J	G-30					
Bromomethane								
Vinyl chloride	12/38	380 J	F-10	4/38	170	B-10	21	I-10
Chloroethane	1/38	0.8 J	C-10					
Methylene chloride	3/38	190	R-50R	2/38	17,000 J	R-10	26,000	E-10
Acetone	14/38	31,000	S-50	6/38	780 J	B-30	47,000	B-10
Carbon disulfide	3/38	0.2 J	Q-50					
1,1-Dichloroethene	1/38	0.5 J	MW-1					
1,1-Dichloroethane	11/38	400 J	R-10	6/38	910	B-10	560	I-10
cis-1,2-Dichloroethene	11/38	1,800 J	F-10	9/38	1,100 J	F-10		
trans-1,2-Dichloroethene	4/38	2,400	E-10R	1/38	120 J	B-10	4,800	MW-1
Chloroform								
1,2-Dichloroethane	5/38	0.9 J	MW-2S					
2-Butanone	8/38	6,000	S-50	7/38	1,300 J	B-10	4,800 J	I-30
Bromochloromethane								
1,1,1-Trichloroethane	2/38	820 J	R-10	3/38	2,700 J	R-10		
Carbon tetrachloride								
Bromodichloromethane								
1,2-Dichloropropane	4/38	440 J	E-10R	4/38	1,900 J	R-10	100 J	B-10
cis-1,3-Dichloropropene								
Trichloroethene	6/38	730 J	R-10	6/38	1,800 J	E-10	240,000	MW-1
Dibromochloromethane								
1,1,2-Trichloroethane	1/38	0.2 J	G-10	2/38	300	B-10		
Benzene	10/38	120	E-10R	7/38	930 J	R-10		
trans-1,3-Dichloropropene								
4-Methyl-2-pentanone	12/38	3,700 J	F-10	12/38	38,000	R-10	460,000	E10
2-Hexanone	1/38	2 J	D-30	1/38	84 J	G-30		
Tetrachloroethene	2/38	3	G-10	2/38	130 J	B-10		
Toluene	12/38	56,000	R-10	7/38	120,000 J	R-10	84,000	E-10
Chlorobenzene	2/38	14 J	B-10					
Ethyl benzene	11/38	11,000	R-10	11/38	23,000	R-10	22,000	E-10
Styrene	1/38	2 J	D-10	1/38	5 J	D-10		
Xylenes (Total)	11/38	37,000	R-10	15/38	57,000	R-10	54,000	E-10
1,3-Dichlorobenzene	1/38	3 J	D-30					
1,4-Dichlorobenzene	1/38	0.1 J	V-50					
1,2-Dichlorobenzene								
1,2-Dibromo-3-chloropropane								
1,2,4-Trichlorobenzene				1/38	10	D-10		
Inorganics								
Aluminum	10/38	4,120	P-50	15/38	7,280	P-50	55,100	D-10
Antimony	5/38	3.8 J	D-10	1/38	33.1	U-50		
Arsenic	35/38	104 J	S-50	15/38	76.2	D-30	178	D-30
Barium	38/38	12,400	V-50	37/38	8,210	Q-50	1,440	K-30
Beryllium	3/38	1.6	V-50					
Cadmium	11/38	11.0 J	Q-50					
Calcium	38/38	999,000 J	Q-50	38/38	1,250,000	Q-50	814,000	MW-3
Chromium	38/38	216	H-30	7/38	105	MW-4S	1,120 J	G-10
Cobalt	28/38	141	S-50	6/38	42.5	E-10	50	MW-2
Copper	27/38	847	G-10	3/38	727	G-10	6,060 J	G-10
Iron	38/38	92,700	Q-50	35/38	115,000	Q-50	82,200	MW-3
Lead	6/38	7.9	C-10	9/38	52.6 J	T-10	263 J	F-30
Magnesium	38/38	666,000	D-10	38/38	592,000	D-10	664,000	A-10
Manganese	38/38	4,370	V-10	36/38	1,840	V-10	8,330	MW-3
Mercury				6/38	0.69	P-50	2.81 J	MW-3
Nickel	38/38	546	R-10	26/38	725	R-10	16,600	B-30
Potassium	38/38	25,500,000	D-30	38/38	16,400,000	E-50	2,120,000	A-30
Selenium	3/38	6.0	H-10	5/38	31.3	S-10	212 J	G-30
Silver								
Sodium	38/38	13,000,000	B-30	37/38	14,900,000	E-50	15,500,000 J	L-30
Thallium	5/38	5.8	MW-2D	4/38	64.0 J	C-30	76 J	A-30
Vanadium	28/38	20.6	B-10	2/38	76.9	S-10	90	D-10
Zinc	14/38	375 J	G-10	26/38	338	G-10	2,100	C-30
Cyanide	14/38	845 J	R-10	25/38	1,580	R-10	7,830 J	E-10
Chromium (VI)	4/38	120 J	C-10	18/38	90.0 J	B-10		

Key:

J= Estimated value

N= Parameter did not meet all of the United States Environmental Protection Agency's defined identification criteria

(1) Blank spaces denote that the parameters were below their respective laboratory quantitation limits, the data were rejected, or the parameters were not analyzed (1986-87 Remedial Investigation only).

TABLE 5-3
SUMMARY OF THE TARGET COMPOUND LIST/TARGET ANALYTE LIST RESULTS
AND COMPARISON WITH PREVIOUSLY COLLECTED DATA (1)
MIDCO II SITE
GARY, INDIANA

	1997 Annual Ground Water Monitoring			1996 Annual Ground Water Monitoring			1993 Predesign Investigation			1986-87 Remedial Investigation	
Parameter	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration
Semivolatile Organic Compounds											
Phenol	3/38	260	B-30	5/38	330 J	B-30	11/38	210	E-10	560 J	E-10
bis(2-Chloroethyl)ether							1/38	10	D-10	11 J	B-10
2-Chlorophenol							1/38	18	D-10		
2-Methylphenol	2/38	680 J	R-10	3/38	1,200	R-10	5/38	420	R-10	170	F-10
4-Methylphenol (2)	3/38	400 J	F-10	4/38	500	R-10	8/38	480	R-10	460	A-10
N-Nitroso-di-n-propylamine							1/38	9	D-10		
Hexachloroethane							1/38	10	D-10		
Isophorone	3/38	56	R-50	4/38	77 J	R-10	7/38	6,500	R-10	14,000	E-10
2,4-Dimethylphenol	6/38	560 J	R-10	6/38	460	R-10	6/38	160 J	R-10	600 N	A-10
2,4-Dichlorophenol							3/38	97	R-10	6.2	B-10
1,2,4-Trichlorobenzene							1/38	10	D-10		
Naphthalene	5/38	37	D-10, E-10	6/38	250	R-10	13/38	250 J	R-10		
4-Chloroaniline	1/38	2	P-10								
4-Chloro-3-methylphenol							1/38	1 J	U-10		
2-Methylnaphthalene	3/38	63	D-10	4/38	210	C-10	9/38	16	E-10	7,100	MW-8
2,4,6-Trichlorophenol							2/38	22	D-10		
2,4,5-Trichlorophenol							1/38	3 J	U-10		
2-Nitroaniline							1/38	2 J	U-10		
Dimethyl phthalate							1/38	20 J	R-10		
Acenaphthene	1/38	2 J	D-10	2/38	46 J	C-10	4/38	3 J	C-10	530 J	MW-8
4-Nitrophenol							2/38	2 J	MW-3S	5.2 J	B-30
Dibenzofuran							3/38	1 J	C-10, U-10	200 N	MW-8
2,4-Dinitrotoluene							2/38	9	D-10	2.8 J	B-30
Diethyl phthalate							1/38	10	D-10	19 J	L-30, MW-5
4-Chlorophenyl phenyl ether							1/38	1 J	U-10		
Fluorene	1/38	2 J	D-10	1/38	60 J	C-10	5/38	10	G-30	730	MW-8
4,6-Dinitro-2-methylphenol							1/38	3 J	U-10		
N-Nitrosodiphenylamine							7/38	11 J	D-10, E-10 (J)		
Hexachlorobenzene							2/38	12	D-10		
Pentachlorophenol							9/38	8 J	U-10		
Phenanthrene	2/38	10 J	C-10	1/38	140	C-10	6/38	2 J	U-10	1,100	MW-8
Anthracene				1/38	39 J	C-10	4/38	2 J	U-10	1,100	MW-8
Di-n-butyl phthalate	3/38	1 J	T-50, U-50				11/38	14 J	F-30	160 J	MW-8
Fluoranthene							3/38	3 J	U-10		
Pyrene				1/38	25 J	C-10	5/38	4 J	U-10	130 J	MW-8
bis(2-Ethylhexyl)phthalate							1/38	58 J	P-10	430 J	MW-8
Di-n-octyl phthalate							4/38	16 J	R-10	10 J	F-10
Benzo(b)fluoranthene							2/38	4 J	U-10		
Benzo(g,h,i)perylene							1/38	10	G-10		
Benzoic acid	7/38	3 J	V-50	4/38	2,100 J	R-10	19/38	3,500 J	E-10	2,800 J	E-10
Acetophenone				4/38	290	R-10					
3-Methylphenol (2)							8/38	480	R-10	460	A-10

FIVE-YEAR REVIEW
TABLE 12

TABLE 5-3
SUMMARY OF THE TARGET COMPOUND LIST/TARGET ANALYTE LIST RESULTS
AND COMPARISON WITH PREVIOUSLY COLLECTED DATA (1)
MIDCO II SITE
GARY, INDIANA

Parameter	1997 Annual Ground Water Monitoring			1996 Annual Ground Water Monitoring			1993 Predesign Investigation			1986-87 Remedial Investigation	
	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration
Semivolatile Organic Compounds (continued)											
N-Nitrosopyrrolidine				1/38	38 J	Q-50					
Polynuclear Aromatic Hydrocarbons											
Benzo(a)anthracene	1/38	1.0	C-10	2/38	6.4	C-10	19/38	1.2 J	E-10	140 J	MW-8
Chrysene	1/38	1.7 JN	C-10	1/38	0.30	R-10	13/38	4.7 J	E-10	140 J	MW-8
Benzo(b)fluoranthene	1/38	0.16	C-10	2/38	6.9	C-10	15/38	0.94 J	E-10		
Benzo(a)pyrene	1/38	0.50	C-10	4/38	6.8 J	C-10	21/38	1.0 J	E-10		
Dibenz(a,h)anthracene	1/38	0.40	C-10	1/38	0.18	R-10	12/38	0.051 J	C-10		
Indeno(1,2,3-cd)pyrene				1/38	0.26	R-10	7/38	0.49 J	E-10		
3-Methylcholanthrene	1/38	0.24 J	C-10	1/38	4.6 J	C-10					
7,12-Dimethylbenzanthracene	1/38	0.39 J	C-10	3/38	3.1 J	C-10					
Chlorinated Pesticides/Polychlorinated Biphenyls											
alpha-BHC	3/38	0.023 J	V-10	1/38	0.10	V-10	8/38	0.0039 J	E-10		
beta-BHC	4/38	0.39 J	C-10				4/38	0.025 J	R-50		
delta-BHC	2/38	0.0042 J	V-10	1/38	0.015	U-10	14/38	0.021	R-50		
gamma-BHC (Lindane)	2/38	0.015 J	E-10				10/38	0.047 J	F-10		
Heptachlor	6/38	0.23 J	C-10				1/38	0.011	H-30		
Aldrin	3/38	0.18 J	C-10				7/38	0.0040 J	T-50		
Heptachlor epoxide	1/38	0.0036 J	V-10				9/38	0.030 J	R-10	0.22	D-10
Endosulfan I							14/38	0.011 J	U-10		
Dieldrin	4/38	0.042 J	V-10				15/38	0.014 J	F-10		
4,4'-DDE							8/38	0.040 J	F-10		
Endrin	1/38	0.00060 J	V-10				13/38	0.022 J	R-10		
Endosulfan II							11/38	0.025 J	D-30		
4,4'-DDD							2/38	0.0048 J	E-10		
Endosulfan sulfate							7/38	0.030 J	R-10		
4,4'-DDT							3/38	0.0035 J	R-50		
p,p'-Methoxychlor							5/38	0.23 J	B-10		
Endrin ketone							7/38	0.017 J	R-10		
Endrin aldehyde	1/38	0.0020 J	V-10				1/38	0.0011 J	MW-4S		
alpha chlordane							10/38	0.0037 J	T-10		
gamma chlordane	3/38	0.0029 J	P-10				7/38	0.036 J	R-10		
Aroclor-1242				1/38	2.4 J	D-10					
Aroclor-1248	2/38	23	C-10	1/38	160	C-10				37	MW-8
Aroclor-1260				1/38	4.4 J	C-10					
Inorganics											
Aluminum	19/38	20,600	R-50	10/38	4,120	P-50	15/38	7,280	P-50	55,100	D-10
Antimony	4/38	32.4	MW-50	5/38	3.8 J	D-10	1/38	33.1	U-50		
Arsenic	33/38	91.3	MW-4D	35/38	104 J	S-50	15/38	76.2	D-30	178	D-30
Barium	38/38	10,300 J	V-50	38/38	12,400	V-50	37/38	8,210	Q-50	1,440	K-30
Beryllium	1/38	1.0	E-50	3/38	1.6	V-50					

TABLE 5-2

SUMMARY OF THE COMPARISON OF ANALYTICAL RESULTS WITH THE CLEAN-UP ACTION LEVELS (1,2,3)
MIDCO II SITE, GARY, INDIANA
(Page 1 of 4)

Monitoring Location	Carcinogenic Risk (4)			Noncarcinogenic Risk (4)			Parameters at or Above MCL or AWQC				Background
	Total	Contributing Parameters	Concentration (µg/L)	Total	Contributing Parameters	Concentration (µg/L)	Parameter	Concentration (µg/L)	MCL (µg/L)	AWQC (µg/L)	Concentration (5) (µg/L)
MW-1	5E-04	Trichloroethene	230	15	(7)		cis-1,2-Dichloroethene	87	70		
		1,1-Dichloroethene	0.6 J				Trichloroethene	230	5		
		Tetrachloroethene	4				Cyanide	9,500	200	18.7	158
MW-50	3E-03	(7)		8	Barium	7,630	Arsenic	55.6	10	173	15.1
					Arsenic	55.6	Barium	7,630	2,000		107
					Thallium	3.9 J	Iron	40,500		3,600	15,300
							Thallium	3.9 J	2	144	
MW-2S	0E+00			0.2							
MW-2D	3E-03	(7)		3	Arsenic	48.7	Arsenic	48.7	10	173	15.1
					Barium	2,220	Barium	2,220	2,000		107
							Iron	19,000		3,600	15,300
MW-3S	0E+00			0.5							
MW-3D	3E-03	(7)		3	Arsenic	52.8	Arsenic	52.8	10	173	15.1
					Barium	1,990	Iron	18,700		3,600	15,300
MW-4S (6)	0E+00			0.05							
MW-4D (6)	5E-03	Arsenic	95.7	10	2-Butanone	1,900	Arsenic	95.7	10	173	15.1
		1,1-Dichloroethene	0.6 J		Arsenic	95.7	Barium	3,600	2,000		107
					Barium	3,600	Iron	18,600		3,600	15,300
					Acetone	2,800	Methylene Chloride	22 J	5		1.9
					4-Methyl-2-pentanone	730					
B-10	1E-06			0.03							
B-30	3E-03	(7)		3	Arsenic	59.1 J	Arsenic	59.1 J	10	173	15.1
					Barium	1,130					
C-10	2E-03	Arsenic	45.0 J	2	Arsenic	45.0 J	Benzene	11	5		0.04
		Benzene	11		Barium	243	Arsenic	45.0 J	10	173	15.1
					Manganese	948					
C-30	4E-03	(7)		3	Arsenic	69.0 J	Arsenic	69.0 J	10	173	15.1
					Barium	601	Chromium (III) (9)	151	100	2,010	7.5
					Antimony	3.5 J					
					Nickel	116					
D-10 (6)	2E-04	Benzene	36	0.07			1,2-Dichloropropane	12	5		
		1,2-Dichloropropane	12				Benzene	36	5		0.04
		1,2-Dichloroethane	2								
D-30 (6)	4E-03	Arsenic	71.3	4	Arsenic	71.3	Arsenic	71.3	10	173	15.1
		Benzene	3		Thallium	4.2 J	Thallium	4.2 J	2	144	

FIVE-YEAR REVIEW
TABLE 13

TABLE 5-2

SUMMARY OF THE COMPARISON OF ANALYTICAL RESULTS WITH THE CLEAN-UP ACTION LEVELS (1,2,3)
MIDCO II SITE, GARY, INDIANA
(Page 2 of 4)

Monitoring Location	Carcinogenic Risk (4)			Noncarcinogenic Risk (4)			Parameters at or Above MCL or AWQC				Background
	Total	Contributing Parameters	Concentration (µg/L)	Total	Contributing Parameters	Concentration (µg/L)	Parameter	Concentration (µg/L)	MCL (µg/L)	AWQC (µg/L)	Concentration (5) (µg/L)
E-10 (6)	4E-03	Arsenic	60.2	7	Xylenes (Total)	11,000	cis-1,2-dichloroethene	300	70		
		Benzene	86 J		Arsenic	60.2	1,2-Dichloropropane	34 J	5		
		1,2-Dichloropropane	34 J		Toluene	4,600	Benzene	86 J	5		0.04
					Ethyl Benzene	2,600	Toluene	4,600	1,000		
					4-Methyl-2-pentanone	360	Ethyl Benzene	2,600	700		
					Antimony	2.1 J	Xylenes (Total)	11,000	10,000		
							Arsenic	60.2	10	173	15.1
							Copper	158		120	25.2
E-50R (6)	4E-03	Arsenic	65.6	3	Arsenic	65.6	Methylene Chloride	13	5		1.9
		Methylene Chloride	13		Barium	1,240	Arsenic	65.6	10	173	15.1
F-10 (6)	3E-05	(7)		7	Xylenes (Total)	13,000	Benzene	8 J	5		0.04
					Toluene	11,000	Toluene	11,000	1,000		
					Ethyl Benzene	5,200	Ethyl Benzene	5,200	700		
							Xylenes (Total)	13,000	10,000		
F-30 (6)	2E-03	Arsenic	40.6 J	4	4-Methyl-2-Pentanone	4,300	Arsenic	40.6 J	10	173	15.1
		Methylene Chloride	90 J		Arsenic	40.6 J	Methylene Chloride	90 J	5		1.9
G-10 (6)	2E-05	Trichloroethene	7	0.7			Trichloroethene	7	5		
		1,2-Dichloroethane	0.7 J				Copper	191		120	25.2
		Tetrachloroethene	2								
		Benzene	0.4 J								
G-30	2E-03	Arsenic	43.2	2	Arsenic	43.2	Methylene Chloride	13	5		1.9
		Methylene Chloride	13		Barium	669	Arsenic	43.2	10	173	15.1
					Antimony	3.1 J	Chromium (III) (9)	164	100	2,010	7.5
					Nickel	85.0					
H-10	0E+00			0.9			Selenium	62.5	50	126	
H-30	2E-03	(7)		3	Barium	1,860	Arsenic	36.6	10	173	15.1
					Arsenic	36.6	Chromium (III) (9)	219	100	2,010	7.5
					Nickel	125					
					Manganese	650					
N-10	1E-03	Arsenic	22.0	0.9			Vinyl Chloride	3	2		2.2
		Vinyl Chloride	3				Arsenic	22.0	10	173	15.1
N-50	4E-03	(7)		3	Arsenic	72.7	Arsenic	72.7	10	173	15.1
					Barium	1,820	Iron	73,900		3,600	15,300
P-10	0E+00			0.3							
P-50	4E-03	(7)		3	Arsenic	70.0	Antimony	6.2 J	6		
					Antimony	6.2 J	Arsenic	70.0	10	173	15.1
					Barium	315	Iron	36,100		3,600	15,300
Q-10	0E+00			1	Antimony	11.7	Antimony	11.7	6		
					Barium	194					
Q-50	4E-03	(7)		6	Barium	4,150	Antimony	18.2	6		
					Arsenic	67.0	Arsenic	67.0	10	173	15.1
					Antimony	18.2	Barium	4,150	2,000		107
							Iron	26,800		3,600	15,300

TABLE 5-2

SUMMARY OF THE COMPARISON OF ANALYTICAL RESULTS WITH THE CLEAN-UP ACTION LEVELS (1,2,3)
MIDCO II SITE, GARY, INDIANA
(Page 3 of 4)

Monitoring Location	Carcinogenic Risk (4)			Noncarcinogenic Risk (4)			Parameters at or Above MCL or AWQC				Background
	Total	Contributing Parameters	Concentration (µg/L)	Total	Contributing Parameters	Concentration (µg/L)	Parameter	Concentration (µg/L)	MCL (µg/L)	AWQC (µg/L)	Concentration (5) (µg/L)
R-10 (6)	6E-04	Benzene	110 J	25	Toluene	50,000	cis-1,2-Dichloroethene	1,100 J	70		
		Tetrachloroethene	110 J		Xylenes (Total)	36,000	1,1,1-Trichloroethane	680 J	200		
					Ethyl Benzene	12,000	Benzene	110 J	5		0.04
					Acetone	1,600 J	Tetrachloroethene	110 J	5		
					1,1,1-Trichloroethane	680 J	Toluene	50,000	1,000		
							Ethyl Benzene	12,000	700		
							Xylenes (Total)	36,000	10,000		
							Iron	22,100		3,600	15,300
R-50 (6)	1E-03	Arsenic	23.9 J	4	Thallium	3.9 J	Trichloroethene	13 J	5		
		Trichloroethene	13 J		4-Methyl-2-pentanone	1,300	Arsenic	23.9 J	10	173	15.1
					Arsenic	23.9 J	Thallium	3.9 J	2	144	
					Barium	495					
					Nickel	69.1					
S-10	1E-03	Arsenic	22.0	3	Vanadium	320	Arsenic	22.0	10	173	15.1
		Benzene	0.4 J		Selenium	83.8	Selenium	83.8	50	126	
					Arsenic	22.0					
					Chromium (VI)	30					
S-50 (6)	5E-03	(7)		4	Arsenic	92.9	Arsenic	92.9	10	173	15.1
					Barium	1,950					
T-10 (6)	8E-04	Arsenic	15.4	0.6			Arsenic	15.4	10	173	15.1
		Benzene	4								
T-50 (6)	3E-03	(7)		14	2-Butanone	3,100	Arsenic	63.6	10	173	15.1
					Barium	5,470	Barium	5,470	2,000		107
					Acetone	9,100					
					Arsenic	63.6					
U-10	2E-03	Arsenic	29.0	1	Arsenic	29.0	Benzene	12	5		0.04
		Benzene	12		Manganese	2,820	Arsenic	29.0	10	173	15.1
							Iron	37,500		3,600	15,300
U-50	3E-03	(7)		2	Arsenic	59.2	Arsenic	59.2	10	173	15.1
					Barium	586	Iron	43,700		3,600	15,300
V-10	0E+00			0.2							
V-50	3E-03	(7)		4	Barium	3,840	Arsenic	63.9	10	173	15.1
					Arsenic	63.9	Barium	3,840	2,000		107
							Iron	49,800		3,600	15,300

TABLE 5-2

SUMMARY OF THE COMPARISON OF ANALYTICAL RESULTS WITH THE CLEAN-UP ACTION LEVELS (1,2,3)
MIDCO II SITE, GARY, INDIANA
(Page 4 of 4)

	Carcinogenic Risk (4)			Noncarcinogenic Risk (4)			Parameters at or Above MCL or AWQC				Background
Monitoring Location	Total	Contributing Parameters	Concentration (µg/L)	Total	Contributing Parameters	Concentration (µg/L)	Parameter	Concentration (µg/L)	MCL (µg/L)	AWQC (µg/L)	Concentration (5) (µg/L)
P-1	2E-03 (7)			1	Arsenic	35.5 J	Arsenic	35.5 J	10	173	15.1
					Barium	336					
					Manganese	871					
P-2	1E-03 (7)			1	Arsenic	21.8	Arsenic	21.8	10	173	15.1
					Antimony	3.2 J					
					Manganese	1,330					
					Barium	132					
					Selenium	2.9 J					
P-3	2E-03 (7)			3	Barium	1,810	Arsenic	34.9	10	173	15.1
					Arsenic	34.9	Iron	27,500		3,600	15,300
					Antimony	2.1 J					
					Nickel	78.1					
					Acetone	360					

Key:
µg/l = Micrograms per liter
MCL = Maximum Contaminant Level. MCL's were obtained from 40 CFR Sec. 141
AWQC = Aquatic Water Quality Criteria. Obtained from Table 2 of Attachment 2 of the Statement of Work
J = The concentration is approximate due to limitations identified during the quality assurance review
CFR = Code of Federal Regulations

(1) All parameters detected below the background concentrations were not considered, as established in Attachment 2 of the Statement of Work.
(2) The complete validated data tables and risk calculation tables are included in Appendices F and G, respectively.
(3) The quantitation limits for thallium at all locations except for F-10 and U-10, were above their respective Clean-up Action Levels, as indicated in Table 5-3.
(4) Parameters are shown only if the cumulative risks for the location are above the acceptable carcinogenic risk of 1E-05 or above the acceptable noncarcinogenic risk of 1, and:
- Parameters produce individual carcinogenic risks above 1E-05, or they produce individual carcinogenic risks higher than 1E-06 and their sum produces a cumulative carcinogenic risk above 1E-05; or
- Parameters produce individual noncarcinogenic risks above 1, or (for parameters with the same effects) they produce individual noncarcinogenic risks above 0.1 and their sum produces a cumulative noncarcinogenic risk above 1.

Parameters are shown in order of risk produced for the risk columns and in the order shown in Table 5-1 for the comparison with the MCLs and AWQCs.
(5) The background concentrations were obtained from Table 1 of Attachment 2 of the Midco I and II Statement of Work, dated June 1992.
(6) This location had parameters, excluding thallium and silver, with quantitation limits above their respective Clean up Action Levels, as indicated in Table 5-3.
(7) The carcinogenic or noncarcinogenic risk calculated for this location is above 1E-05 or 1, but it is produced by a single analyte for which an MCL has been promulgated (the list of parameters per sampling locations and risk type is included in Appendix B). In accordance to Attachment 2 of the Statement of Work, the analyte should not be included in the risk calculation, and its clean-up action level should be the corresponding MCL or AWQC, whichever is lower.
(8) See Table B-2 in Appendix B.
(9) The MCL is for total chromium and the AWQC is for trivalent chromium. The value detected is the result for total chromium.

Table 14 – Results of Additional Investigations Conducted by ERM and Environ during 2002

INVESTIGATION	RESULTS
Groundwater sampling to evaluate whether elevated nickel and chromium in samples from certain monitoring wells could be caused by well corrosion.	Elevated nickel, chromium and vanadium detections indicate actual groundwater contamination, and not the effects of corrosion of the well casings.
Analyses of filtered and unfiltered samples for arsenic, barium, chromium, copper, manganese, nickel and vanadium in groundwater to evaluate whether a significant portion of these metals is actually from suspended solids.	In general, there was reasonable agreement between filtered and unfiltered results, which verifies that the total metals results can be used to represent concentrations of metals in the aquifer, and which validates that the low flow sampling procedure being used. The only exception was chromium, manganese and nickel at well H-30. Therefore, it is possible that some of the chromium, manganese and nickel contamination at H-30 is actually from solids in the aquifer.
Analysis of total cyanide and cyanide amenable to chlorination.	A significant portion of the cyanide in groundwater is not amenable to chlorination.
Analysis of arsenic by ICP and ICP-MS to check for interference in the ICP method.	There was reasonable agreement between the ICP and ICP-MS results. Therefore, there is no significant interference in the ICP method.
Test pit investigation to delineate the extent of any LNAPL.	No significant LNAPL was located.

Table 15 – EPA and Weston Inspections of Midco II from October 1998 – April 2004

DATE	INSPECTOR	RESULTS
5 days 11/98 12/98	Om Patel, Weston	Oversaw emptying of drill cuttings onto sediment storage area and drum crushing.
12/16 / 98	Om Patel, Weston	Oversaw the quarterly influent and effluent sampling. Weston identified a couple concerns with the sample collection procedures, and poor ventilation in treatment building. In response, ERM removed barrels of waste oil from the oil/water separator from the treatment building.
4/ 19-29/ 99	Weston	Oversaw annual groundwater sampling.
9 / 99	Om Patel, Weston	Oversaw influent and effluent sampling. Weston observed 3 drums of sludge from cleaning the influent storage tank, and noted that these must be disposed off-site.
10/17/00	Rich Boice, EPA	Operation OK.. 3 large piles of pre-filters observed.
2/14/01	Weston	Oversaw water level survey. Identified poor reproducibility in measurements, and apparent inconsistencies with Health and Safety Plan. In response, Environ conducted a safety audit.
4 / 01	Weston	Oversaw annual groundwater monitoring.
6/14/01	Weston	Oversight of water level survey. Identified poor reproducibility in measurements.
9/27/01 10/16/01	Om Patel, Weston	Oversaw operation during increased pumping rates. System was shutdown the first time because of GC problems and the second because of software problems.
1/28/02	Weston	Oversaw pipeline repair, and inspected treatment operation and on-site storage. Weston found out that methylene chloride routinely exceeds MAC according to GC readings after change of pre-filters. Environ committed to put UV/HP into a tube cleaning cycle after change of filters, and conducted GC sampling at 15 minute intervals for the next three months.
1/21/02	Weston	Oversaw pressure test on the repaired pipeline.
2/20/02	Weston	Oversaw water level measurements for capture zone evaluation.
2/22/02	Rich Boice, EPA	Inspected treatment system.
3/12, 3/13, 3/14/02	Weston	Oversaw special groundwater sampling to investigate metals contamination from corrosion, aquifer solids and background..
3/20, 3/21/02	Weston, Rich Boice, EPA	Oversaw exploratory excavations to investigate the extent of LNAPL.
4/22, 4/23, 4/24, 4/25/02	Weston	Oversaw annual groundwater sampling.

Continuation: Table 15 – EPA and Weston Inspections of Midco II from October 1998 – April 2004		
2/26/03	Om Patel, Weston	Inspected treatment operation during 3-day compliance test. Identified that the Operation and Maintenance Health and Safety Plan had not been updated to include chemicals used for the clarifier.
6/24/03	Om Patel, Weston Rich Boice, EPA	Inspected treatment operation and storage. The Environ operators provided a print out displaying the migration of VOC peaks apparently due to change in temperature during the day.
8/14/03	Om Patel, Weston Rich Boice, EPA	Inspected treatment operation.
9/19/03	Om Patel, Weston	Inspected treatment operation. In response to Weston concerns, Environ said that bags containing filter cake would be covered with a tarp later that day.
10/9/03	Rich Boice, EPA Om Patel, Weston	Pre-construction inspection. Inspect treatment system.
10/14–10/16, 11/11–11/19/03	Weston	Oversaw SVE / air sparging pilot test.
10/20/03	Rich Boice, EPA Om Patel, Weston	Inspect set-up for SVE / air sparging test. Inspect treatment system.
4/30/04	Om Patel, Weston	Weston identified that Environ had reduced UV lamp usage from 11 to 4, and had operated the system without a GC for a month without notifying EPA.. In addition, Weston identified that 3 – 4 loads of waste filter cake had accumulated onsite.

Table 16 – Comparison of SF_i and RfD_i from the 1992 ROD Amendment with the SF_i and RfD_i from the 2002 PRG Tables (SF_i is expressed in 1 / MG/KG-D, and RfD_i in MG/KG-D; – means not available or not applicable; sources of PRG values are listed respectively as: i = IRIS[19]; h = HEAST[20]; n = NCEA[21]; r = route extrapolation from IRIS value except 4-cresol was from HEAST; C = Cal EPA[22]; if there are two values the first is for SF_i and the second for RfD_i)

CONTAMINANT	ROD VALUES		2002 PRG TABLE VALUES		
	SF_i	RfD_i	SF_i	RfD_i	SOURCE
VOCs					
Acetone	–	–	–	0.1	r
1,2-Dichloropropane	–	–	0.068	0.0011	r,i
Ethylbenzene	–	–	0.00385	0.29	n,i
Trichloroethylene	0.013	–	0.4	0.01	n,n
4-Methyl-2-pentanone	–	–	–	0.86	i
Tetrachloroethylene	0.0033	–	0.01	0.17	C,n
Toluene	–	1.0	–	0.11	i
Xylenes	–	0.4	–	0.029	i
SVOCs					
Phenol	–	–	–	0.3	i
1,4-dichlorobenzene	–	0.7	0.022	0.23	n,i
Cresol	–	–	–	0.05 / 0.005	r,h
Nitrobenzene	–	0.0006	–	0.00057	h
Isophorone	–	–	0.00095	0.2	r,r
Benzoic acid	–	–	–	4.0	r
2,4-dichlorophenol	–	–	–	0.003	r
4-Chloroaniline	–	–	–	0.004	r
Napththalene	–	–	–	0.00086	i
Diethylphthalate	–	–	–	0.8	r

[19] IRIS is the acronym for EPA's Integrated Risk Information System.

[20] HEAST is the acronym for EPA's 1997 Human Effects Assessment Summary Tables.

[21] NCEA is the acronym for EPA's National Center for Environmental Assessment.

[22] Cal EPA refers to the California EPA Air Toxics Program.

Continuation Table 16 – Comparison of SF_i and RfD_i from the 1992 ROD Amendment with the SF_i and RfD_i from the 2002 PRG Tables					
N-nitrosodiphenyl-amine	–	–	0.0049	–	r
Pentachlorophenol	–	–	0.12	0.03	r,r
Dibutylphthalate	–	–	–	0.1	r
Butylbenzyl-phthalate	–	–	–	0.2	r
Benzo(a)anthracene	–	–	0.73	–	r
Bis(2-ethylhexyl) phthalate	–	–	0.014	0.02	r,r
Chrysene	–	–	0.0073	–	r
Benzo(b)fluoranthene	–	–	0.73	–	r
Benzo(a)pyrene	–	–	7.3	–	r
Indeno(1,2,3-cd) pyrene	–	–	0.73	–	r
Dibenz(a,h) anthracene	–	–	7.3	–	r
Endrin	–	–	–	0.0003	r
PCBs	–	–	2.0	0.00007 / 0.00005	i,r

Table 17 – Comparison of HBLs, PRG (or MCLs if they are available), and Comparison of the MACs, 6.3 X the PRG (or MCL), and Range of Concentrations Detected in Midco II Influent from 3/00 – 6/02 for Contaminants Whose PRGs Are Significantly More Stringent than the HBLs (all units in ug/l)

CONTAMINANT	HBL	PRG (or MCL)	MAC	6.3 X PRG or MCL	Range of Concentrations
Acenapthene	2,000	370	12,300	2,331	< 4 – 2
Acetone	4,000	610	25,200	3,843	28 – 2000
Arsenic	50	10 (MCL)	315	63	25.7 – 37.7
Bis(2-chlorethyl) ether	0.05	0.00098	0.189	0.00033	<4 – <5
Butylbenzyl phthalate	7,000	730	44,100	4,599	<4 – 1
Chlorobenzilate	700	25	4,410	158	< 4 – < 5
2-Chlorophenol	200	30	1,260	189	< 4 – < 5
Copper		1,300 (MCL)		8,190	< 2.6 – 9.3
Cresols	2,000	1,800 / 180	12,600	11,340 / 1,134	12 – 42
Naphthalene	100	6.2	630	39	1 – 24
Nitrobenzene	20	3.4	126	21.4	< 5 – 3
Pyrene	1,000	180	6,300	1,134	< 4 – 0.8

TABLE 3-1

PARAMETER-SPECIFIC CLEANUP ACTION LEVELS [1]
MIDCO I AND II SITES
GARY, INDIANA

Parameter	Background		Project-Specific QL	MCL	AWQC x F		Risk-Based Carc.	Risk-Based Noncarc.	Parameter-specific CAL. [2]	
	Midco I	Midco II			Midco I	Midco II			Midco I	Midco II
Organics:										
Acetone		6.9	5					3,240	3,240	3,240
Benzene		0.04	1	5			2.69		2.69	2.69
2-Butanone			5					588	588	588
Carbon tetrachloride			1	5			0.6	23	1	1
Chlorobenzene			1	100				48.8	48.8	48.8
Chloroform			1				1.2	324	1.2	1.2
1,2-Dibromo-3-chloropropane			1	0.2					1	1
1,2-Dibromoethane (Ethylene dibromide)			1	0.05					1	1
1,2-Dichlorobenzene			1	600				398	398	398
1,4-Dichlorobenzene			1	75			13.5	7,187	13.5	13.5
1,2-Dichloroethane			1	5			0.86		1	1
1,1-Dichloroethene			1	7			0.074	290	1	1
1,1-Dichloroethane			1					779	779	779
cis-1,2-Dichloroethene			1	70					70	70
trans-1,2-Dichloroethene	0.16	6.1	1	100					100	100
1,2-Dichloropropane			1	5			4.76		4.76	4.76
Ethyl benzene			1	700				3,240	700	700
Methylene chloride	1.3	1.9	1	5			6.27	1,830	5	5
4-Methyl-2-pentanone			5					1,620	1,620	1,620
Styrene			1	100					100	100
Tetrachloroethene			1	5			5.27	324	5	5
Toluene			1	1,000				4,990	1,000	1,000
1,2,4-Trichlorobenzene			1	70				29.4	29.4	29.4
1,1,2,2-Tetrachloroethane			1				0.39		1	1
1,1,1-Trichloroethane			1	200				1,500	200	200
1,1,2-Trichloroethane			1	5			1.37	129	1.37	1.37
Trichloroethene			1	5			6.23		5	5
Vinyl chloride	1.32	2.2	1	2			0.1		1.32	2.2
Xylenes (total)			5	10,000				3,860	3,860	3,860
Inorganics:										
Antimony			1	6				12.9	6	6
Arsenic	6	15.1	2	10	187	173	0.18	32.4	6	15.1
Barium	118	107	20	2,000				1,620	1,620	1,620
Beryllium			1	4	20.7	19.1		162	4	4
Cadmium		0.15	1	5	4.68	10.4		32.4	4.68	5
Chromium (III)	8	7.5	1	100	858	2,010		32,400	100	100
Copper		25.2	1		50.7	120			50.7	120
Iron	3,880	15,300	50		3,900	3,600			3,900	15,300
Lead		5.6	1		13.7	53.6			13.7	53.6
Manganese	1,400	464	25					6,470	6,470	6,470
Mercury		0.25	0.2	2	0.0468	0.0432		9.71	0.20	0.25
Nickel	58	12.3	7		655	1,580		647	647	647
Selenium			2	50	137	126		97.1	50	50
Silver		4.6	1		0.468	0.432			1	4.6
Thallium			3	2	156	144		2.27	3	3
Vanadium	4.33		1					227	227	227
Zinc		1,470	1		1,330	3,160		6,470	1,330	3,160
Cyanide	10.4	158	10	200	20.3	18.7		647	20.3	158
Chromium (VI)	8	7.5	10		42.9	39.6		162	42.9	39.6

Key:

MCL = Primary maximum contaminant level, from 40 CFR 141, as of July, 2002.

AWQC x F = Site-specific chronic ambient water quality criteria (AWQC), equal to the federal AWQC for protection of aquatic life times the site-specific factor F; from Table 2 of Attachment 2 of the Midco I and II Statement of Work, dated June 1992

Background = Site-specific background ground water concentrations; from Table 1 of Attachment 2 of the Midco I and II Statement of Work, dated June 1992

QL = Quantitation Limit

Carc. = Carcinogenic risk-based concentration equivalent to 1E-05 carcinogenic risk for the individual parameter.

Noncarc. = Noncarcinogenic risk-based concentration equivalent to 1 noncarcinogenic hazard index for the individual parameter.

CAL = Clean-up Action Level

[1] All concentrations are given in micrograms per liter.

[2] Lowest value between the MCL, AWQC, and the risk-based concentrations calculated as if the parameter was the only parameter detected in the sample, but not less than the project-specific detection limit or the site-specific background concentrations. The risk-based concentrations were calculated by following the procedures in Attachment 2 of the Midco I and Midco II Statement of Work, dated June 1992. These values are only used to assess the effect of the sample detection limits and rejected data on the evaluation of compliance with the CALs for each sampling location. The actual evaluation of compliance with the CALs for each sampling location is summarized in Table 4-2.

FIVE-YEAR REVIEW
TABLE 18

TAB 18

Table 19 – GWCALs, PRGs, and Maximum Midco II Groundwater Detections (and Well Number) from the Most Recent Sampling for Contaminants Whose PRGs are More Stringent than the GWCALs, and for Contaminants Who Do Not Have GWCALs But Have PRGs.[23] (This Table also Identifies the Source of the SF or RfD (for VOCs the first initial is for the oral route and the second for the inhalation route, and for other contaminants only the oral route; sources of PRG values are identified as: i = IRIS; h = HEAST; n = NCEA; r = route extrapolation; C = California EPA, all units are in ug/l, nc = PRG based on noncarcinogenic effects. c = PRG based on carcinogenic effects.)

CONTAMINANT	GWCAL	Adjusted PRG (SF/RfD source)	MAXIMUM CONCENTRATION (Well #)
VOCs			
Acetone	3,240	610 (i,r) (nc)	9,100 (T50)
Bromodichloromethane	–	1.8 (i,r) (c)	ND
Bromoform	–	85 (i,i) (c)	ND
Bromomethane	–	8.7 (i,i) (nc)	2 (MW-4D)
Carbon disulfide	–	1,000 (i,i) (nc)	0.7 (N10)
Chloroethane	–	46 (n,r) (c)	52 (E10)
Chloromethane	–	15 (h,h) (c)	ND
Chlorodibromomethane	–	1.3 (i,r) (c)	ND
1,2-Dibromoethane	1	0.0076 (i,i) (c)	ND
1,3-Dichlorobenzene	–	5.5 (n,r) (nc)	0.2 (P-2)
cis-1,3-Dichloropropene	–	4.0 (i,i) (c)	ND
trans-1,3-Dichloropropene	–	4.0 (i,i) (c)	ND
Ethyl benzene	700	29 (r,n) (c)	12,000 (R10)
Tetrachloroethylene	5	1.0 (C,C)[24] (c)	110 (R10)
Trichloroethylene	5	0.28 (n,n) (c)	230 (MW-1)
Vinyl chloride	1.32	0.2 (i,i) (c)	3 (N10)
Xylenes	3,860	210 (i,i) (nc)	36,000 (R10)

[23] For VOCs, metals, sulfide, fluoride, and cyanide the most recent sampling was in 2002, and for direct injection VOCs, organophosphate pesticides, and Herbicides the most recent sampling was 1997. For SVOCs, chlorinated pesticides, PCBs and low concentration PAHs, the maximum of the 1996 and 1997 sampling is listed.

[24] PRG was adjusted by use of the California EPA Air Toxics Hot Spots Program SF_o and SF_i (see OSWER No. 9285.7-75, June 12, 2003).

Table 19 Continued – GWCALs, PRGs, and Maximum Midco II Groundwater Detections (and Well Number) from the Most Recent Sampling for Contaminants Whose PRGs are More Stringent than the GWCALs, and for Contaminants Who Do Not Have GWCALs But Have PRGs			
Direct Injection VOCs			
Methanol	126,000	18,000 (i,r) (nc)	ND
SVOCs			
Acenapthene	–	370 (i) (nc)	46 (C10)
Anthracene	–	1,800 (i) (nc)	39 (C10)
Aramite	–	27 (i) (c)	ND
Benzo(k)flouranthene	–	9.2 (n) (c)	ND
Benzyl alcohol	–	11,000 (h) (nc)	ND
Bis(2-chloroethyl)ether	–	0.098 (i) (c)	ND
Chlorobenzilate	–	2.5 (h) (c)	ND
2-Chloronaphthalene	–	490 (i) (nc)	ND
2-Chlorophenol	–	30 (i) (nc)	ND
Dibenzofuran	–	24 (n) (nc)	ND
1,3-Dinitrobenzene	–	3.6 (i) (nc)	ND
3,3'-Dichlorobenzidine	–	1.5 (i) (c)	ND
Dimethylphthalate	–	360,000 (h) (nc)	7 (L30)
2,4-Dimethylphenol	–	730 (i) (nc)	560 (R10)
2,4-Dinitrophenol	–	73 (i) (nc)	ND
2,4-Dinitrotoluene	–	73 (i) (nc)	ND
2,6-Dinitrotoluene	–	36 (h) (nc)	ND
Diphenylamine	–	910 (i) (nc)	ND
Flouranthene	–	1,500 (i) (nc)	ND
Flourene	–	240 (i) (nc)	60 (C10)
Hexachlorobutadiene	–	8.6 (i) (c)	ND
Hexachlorocyclopentadiene	–	220 (i) (nc)	ND
Hexachloroethane	–	36 (i) (nc)	ND
4-Methylphenol	1,618	180 (h) (nc)	500 (R10)
Naphthalene	12,940	6.2 (i) (nc)	250 (R10)
2-Nitroaniline	–	1.0 (r) (nc)	ND

Table 19 Continued – GWCALs, PRGs, and Maximum Midco II Groundwater Detections (and Well Number) from the Most Recent Sampling for Contaminants Whose PRGs are More Stringent than the GWCALs, and for Contaminants Who Do Not Have GWCALs But Have PRGs			
Nitrobenzene	16.2	3.4 (i) (nc)	ND
N-nitroso-di-n-propylamine	–	0.096 (i) (c)	ND
N-nitrosopyrrolidine	–	0.32 (i) (c)	38 (Q50)
Pronamide	–	2,700 (i) (nc)	ND
Pyrene	–	180 (i) (nc)	25 (C10)
2,3,4,6-Tetrachlorophenol	–	1,100 (i) (nc)	ND
2,4,5-Trichlorophenol	–	3,600 (i) (nc)	ND
2,4,6-Trichlorophenol	–	3.6 (i) (nc)	ND
Pesticide/PCBs			
alpha-BHC	–	0.11 (i) (c)	0.1 (V10)
beta-BHC	–	0.37 (i) (c)	0.39 (C10)
4,4'-DDD	–	2.8 (i) (c)	ND
4,4'-DDE	–	2.0 (i) (c)	ND
Endosulfan	–	220 (i) (nc)	ND
Toxaphene	–	0.61 (i) (c)	ND
Organophosphate Pesticides			
Dimethoate	–	7.3 (i) (nc)	0.57 (R10)
Methylparathion	–	9.1 (i) (nc)	0.96 (R10)
Herbicides			
2,4-D	–	360 (i) (nc)	5.1 (R10)
2,4,5-T	–	360 (i) (nc)	0.54 (C30)
Inorganics			
Aluminum	–	36,000 (n) (nc)	1,740 (P50)
Arsenic	6	0.45 (i) (c)	95.7 (MW -4D)
Cobalt	–	730 (n) (nc)	84.7 (T50)
Manganese	6,470	880 (i) (nc)	2,820 (U10)
Hydrogen sulfide	–	110 (i) (nc)	46,000 (D10)

Table 20 – Comparison of GWCALs to 3.6 X Ecological Benchmarks, and Maximum Concentrations from 2002 Groundwater Sampling (all units are in ug/l)

CONTAMINANT	GWCAL	ECOLOGICAL BENCHMARK[25]	MAXIMUM CONCENTRATION (WELL #)
Toluene	1,000	628	50,000 (R10)
Xylenes	3,860	6	36,000 (R10)
1,2-Dichlorobenzene	398	57	27 (MW-1)
Bis(2-ethylhexyl)phthalate	23.1	12	ND
4-4'-DDT	0.952	0.0036	ND
Chlordane	0.2489	0.016	0.0029 (P10)
Heptachlor	0.4	0.014	0.23 (C10)
Barium	1,620	14	7,630 (MW50)
Beryllium	4	2	0.7 (E10)
Cadmium	4.68	2.4	2.1 (P3)
Copper	57	24	191 (G10)
Lead	13.7	4.7	8.1 (H30)
Manganese	6,470	287	2,820 (U10)
Nickel	647	314	284 (G10)
Vanadium	227	69	320 (S10)
Zinc	1,330	212	287 (U10)

[25] From memoranda by David Brauner of EPA dated June 4, 2001 and September 16, 2003.

TABLE 2-3

FIVE-YEAR REVIE
TABLE 21

MAXIMUM ALLOWABLE CONCENTRATIONS[1]
MIDCO I AND II SITES
GARY, INDIANA

Parameter	Maximum Allowable Concentration (ug/l)	Parameter	Maximum Allowable Concentration (ug/l)
Volatile Organic Compounds			
Acetone	25,200	1,4-Dioxane	18.9
Acetonitrile	1,260	Ethyl benzene	4,410
Acrolein	3,150	Ethyl methacrylate	18,900
Acrylonitrile	0.378	Isobutanol	63,000
Benzene	31.5	Methacrylonitrile	25.2
Bromodichloromethane	1.89	Methanol	126,000
Bromomethane	315	Methyl chloride	18.9
Carbon disulfide	25,200	Methyl ethyl ketone	12,600
Carbon tetrachloride	31.5	Methyl isobutyl ketone	12,600
Chlorobenzene	630	Methyl methacrylate	18,900
2-Chloro-1,3-butadiene (Chloroprene)	4,410	Styrene	630
Chloroform	37.8	1,1,1,2-Tetrachloroethane	6.3
3-Chloropropene (allyl chloride)	12.6	1,1,2,2-Tetrachloroethane	1.26
Dibromochloromethane	2.52	Tetrachloroethene	31.5
1,2-Dibromo-3-chloropropane	1.26	Toluene	6,300
Dibromomethane	2,520	Tribromomethane (Bromoform)	25.2
Dichlorodifluoromethane	44,100	1,1,1-Trichloroethane	1,260
1,1-Dichloroethane	2.52	1,1,2-Trichloroethane	31.5
1,2-Dichloroethane	31.5	Trichloroethene	31.5
1,1-Dichloroethene	44.1	Trichlorofluoromethane	63,000
cis-1,2-Dichloroethene	441	1,2,3-Trichloropropane	1,260
trans-1,2-Dichloroethene	630	1,3,5-Trinitrobenzene	12.6
Dichloromethane	31.5	Vinyl chloride	12.6
1,2-Dichloropropane	31.5	Xylene (total)	63,000
1,3-Dichloropropene	1.26		
Semivolatile Organic Compounds			
Acenaphthene	12,600	Dibenz(a,h)anthracene	0.00441
Acetophenone	25,200	Di-n-butyl phthalate	25,200
Acrylamide	–	1,2-Dichlorobenzene	3,780
Aniline	37.8	1,4-Dichlorobenzene	472.5
Aramite	6.3	3,3'-Dichlorobenzidine	0.504
Benz(a)anthracene	0.063	2,4-Dichlorophenol	630
Benzidine	0.00126	Diethyl phthalate	189,000
Benzo(a)pyrene	1.26	Diethylstilbesterol	0.000441
Benzo(b)fluoranthene	0.126	Dimethoate	44.1
Benzyl alcohol	63,000	3,3'-Dimethoxybenzidine	18.9
Benzyl chloride	1.26	3,3'-Dimethylbenzidine	0.252
bis(2-Chloroethyl)ether	0.189	7,12-Dimethylbenz(a)anthracene	0.0063
bis(2-Chloroisopropyl)ether	6,300	2,4-Dimethylphenol	4,410
bis(2-Ethylhexyl)phthalate	18.9	Dimethyl phthalate	252,000
Butyl benzyl phthalate	44,100	1,3-Dinitrobenzene	25.2
p-Chloroaniline	630	2,4-Dinitrophenol	441
Chlorobenzilate	4,410	Dinitrotoluene	0.315
2-Chlorophenol	1,260	Di-n-octyl phthalate	4,410
Chrysene	1.26	Diphenylamine	5,670
Cresols	12,600	1,2-Diphenylhydrazine	0.252

TABLE 2-3

MAXIMUM ALLOWABLE CONCENTRATIONS[1]
MIDCO I AND II SITES
GARY, INDIANA
(Page 2 of 3)

Parameter	Maximum Allowable Concentration (ug/l)	Parameter	Maximum Allowable Concentration (ug/l)
Semivolatile Organic Compounds (continued)			
Disulfoton	6.3	N-Nitrosomethylethylamine	0.0126
Epichlorohydrin (1-Chloro-2,3-epoxypropane)	--	N-Nitrosopiperidine	0.0504
2-Ethoxy ethanol	63,000	Nitrosopyrrolidine	0.126
Ethyl ether	126,000	Octamethyl pyrophosphoramide	441
Ethylene dibromide	0.315	Parathion	1,260
Ethyl methanesulfonate	0.0063	Pentachlorobenzene	189
Famphur	6.3	Pentachloronitrobenzene	630
Fluoranthene	6,300	Pentachlorophenol	6.3
Fluorene	6,300	Phenol	126,000
Formic Acid	441,000	Phorate	44.1
Hexachlorobenzene	6.3	Pronamide	18,900
Hexachlorobutadiene	2.52	Pyrene	6,300
Hexachlorocyclopentadiene	315	Pyridine	252
Hexachloroethane	18.9	Safrole	0.63
Hexachlorophene	63	Strychnine and salts	63
Indeno(1,2,3-cd)pyrene	1.26	1,2,4,5-Tetrachlorobenzene	63
Isophorone	56.7	2,3,4,6-Tetrachlorophenol	6,300
3-Methylcholanthrene	0.0252	Tetraethyl dithiopyrophosphate	126
Methyl parathion	56.7	Toluene-2,4-diamine	0.567
Naphthalene	630	Toluene-2,6-diamine	44,100
2-Naphthylamine	0.252	o-Toluidine	0.63
Nitrobenzene	126	p-Toluidine	1.26
2-Nitropropane	0.0252	1,2,4-Trichlorobenzene	56.7
N-Nitroso-di-n-butylamine	0.0378	2,4,5-Trichlorophenol	25,200
N-Nitrosodiethylamine	0.00126	2,4,6-Trichlorophenol	18.9
N-Nitrosodimethylamine	0.00441	1,1,2-Trichloro-1,2,2-trifluoroethane	6,300,000
N-Nitrosodiphenylamine	44.1	Tris(2,3-dibromopropyl)phospate	0.189
N-Nitrosodi-n-propylamine	0.0315		
Pesticides/Polychlorinated Biphenyls			
Aldrin	0.0126	Heptachlor	2.52
Chlordane	12.6	Heptachlor epoxide (alpha, beta, gamma)	1.26
4,4'-DDD	0.63	alpha-HCH (alpha-BHC)	0.0378
4,4'-DDE	0.63	beta-HCH (beta-BHC)	0.126
4,4'-DDT	0.63	Kepone	0.0126
Diallate	3.78	Lindane (gamma-HCH)(gamma-BHC)	1.26
Dieldrin	0.0126	Methoxychlor	2.52
Endosulfan	12.6	Polychlorinated biphenyls	3.15
Endrin	1.26	Toxaphene	18.9
Herbicides			
2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	44.1	2,4,5-TP (Silvex)	315
2,4-Dichlorophenoxyacetic acid (2,4-D)	441	2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	2,520

TABLE 2-3

MAXIMUM ALLOWABLE CONCENTRATIONS[1]
MIDCO I AND II SITES
GARY, INDIANA
(Page 3 of 3)

Parameter	Maximum Allowable Concentration (ug/l)	Parameter	Maximum Allowable Concentration (ug/l)
Inorganics			
Antimony	63	Lead	94.5
Arsenic	315	Mercury	12.6
Barium	6,300	Nickel	630
Beryllium	6.3	Selenium	315
Cadmium	31.5	Silver	315
Chromium	630	Thallium	12.6
Cyanide	1,260	Vanadium	1,260
Fluoride	25,200	Zinc	44,100

NOTE:

(1) The numbers shown were calculated as 6.3 times the health-based levels listed in Attachment 3 of the Statement of Work (SOW), which is included as Appendix A of the remedial design/remedial action (RD/RA) Work Plan (WP). A petition to modify this table is included in Section 7.0 of the WP.

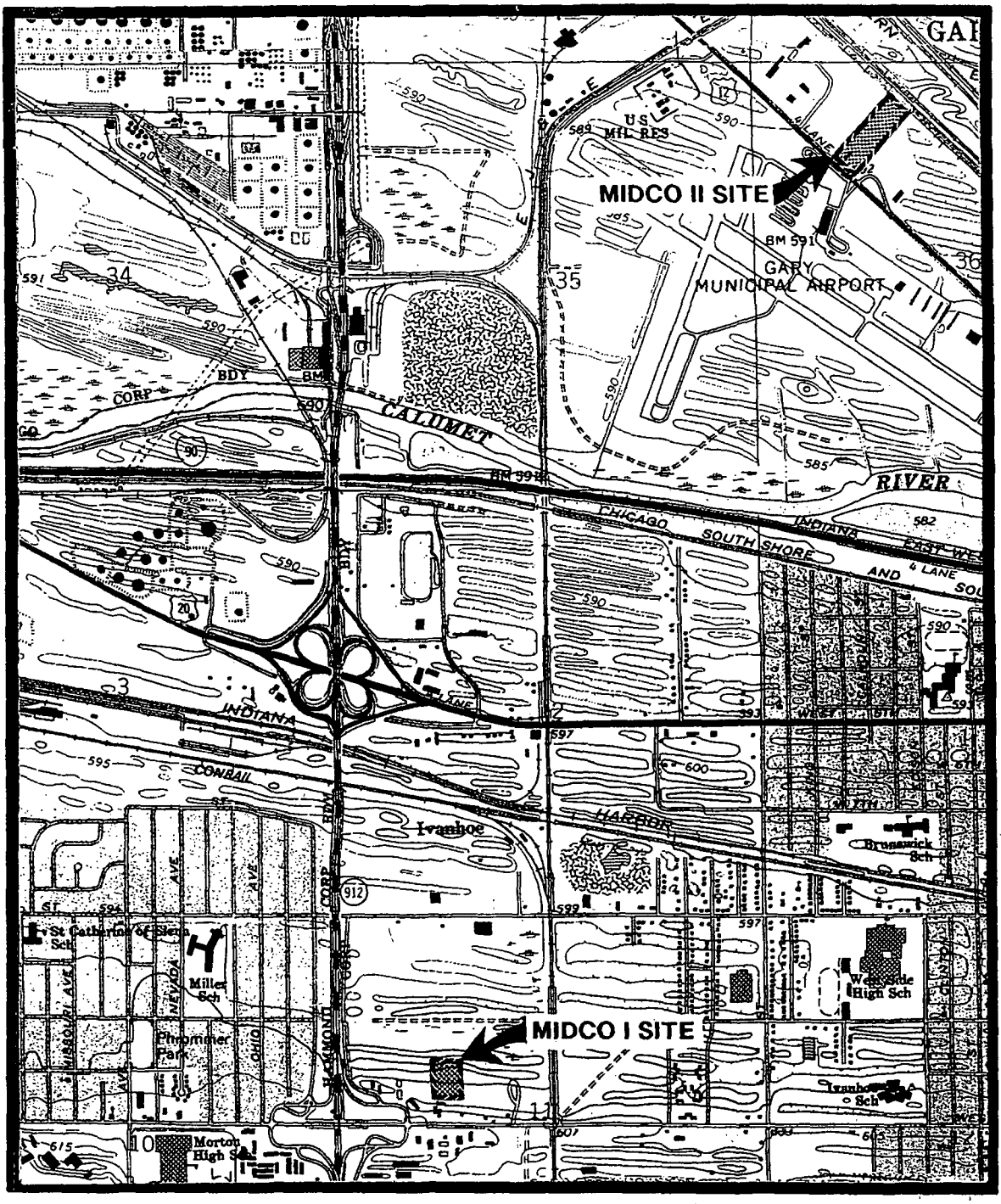
KEY:

-- The parameter's health-based level is shown in Attachment 3 of the SOW as "treatment technique." The SOW is included as Appendix A of the RD/RA WP.

FIGURE 1

WHITING AND HIGHLAND QUADRANGLES

INDIANA–LAKE COUNTY
7.5 MINUTE SERIES (TOPOGRAPHIC)
1968
PHOTOREVISED 1980 AND 1986



SCALE 1:24000

1 .5 0 1 MILE

CONTOUR INTERVAL 5 FEET

FIGURE 1-4

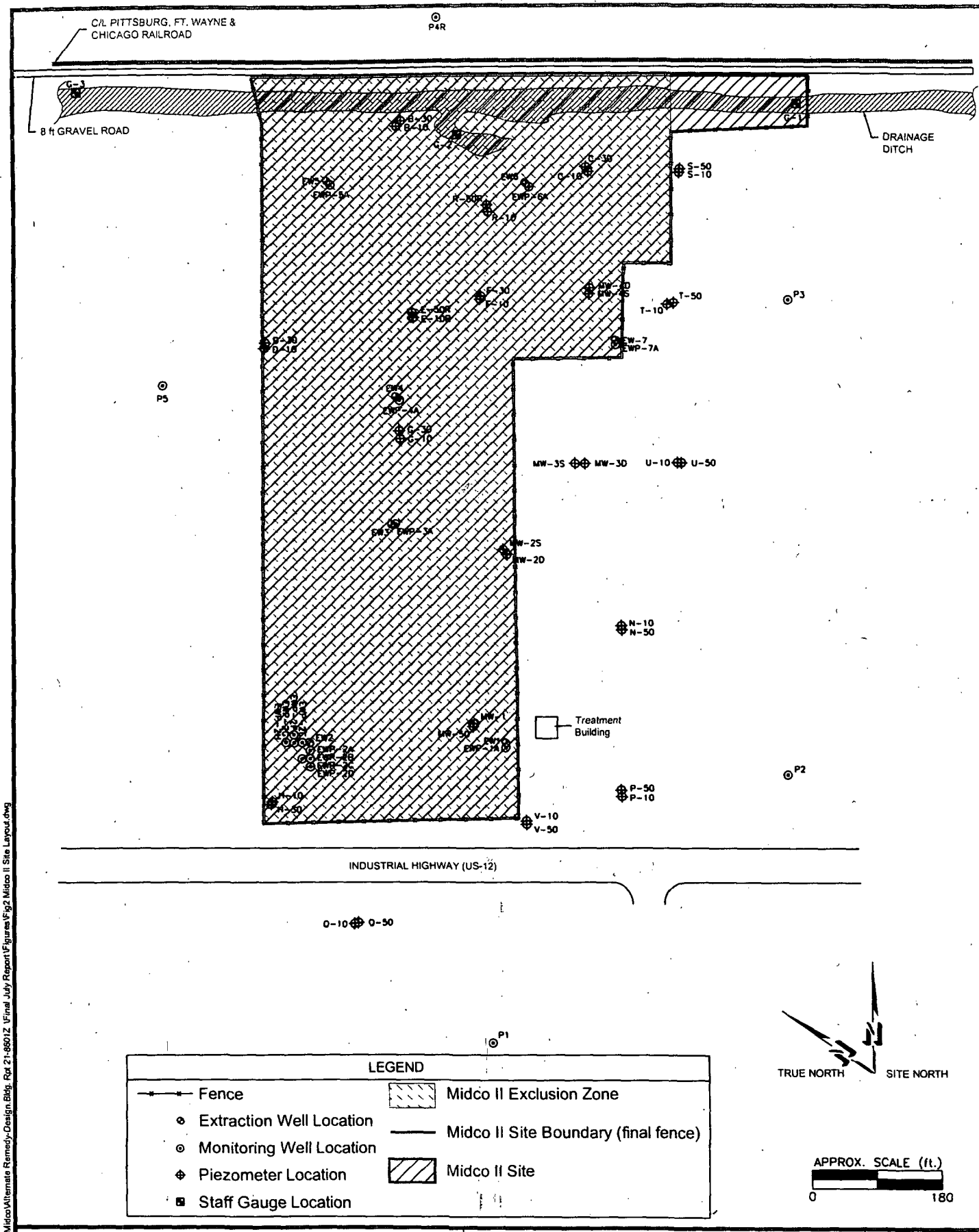
SITE LOCATION MAP
MIDCO I AND II SITES
GARY, INDIANA

FIVE-YEAR REVIEW
FIGURE 1

ERM

PROJECT 92127-9 | REPORT | DRAWN CNM | CHECKED | DATE 8/17/92 | APPROVED | CLIENT NAME MIDCO REMEDIAL CORPORATION

FIVE-YEAR REVIEW FIGURE 2

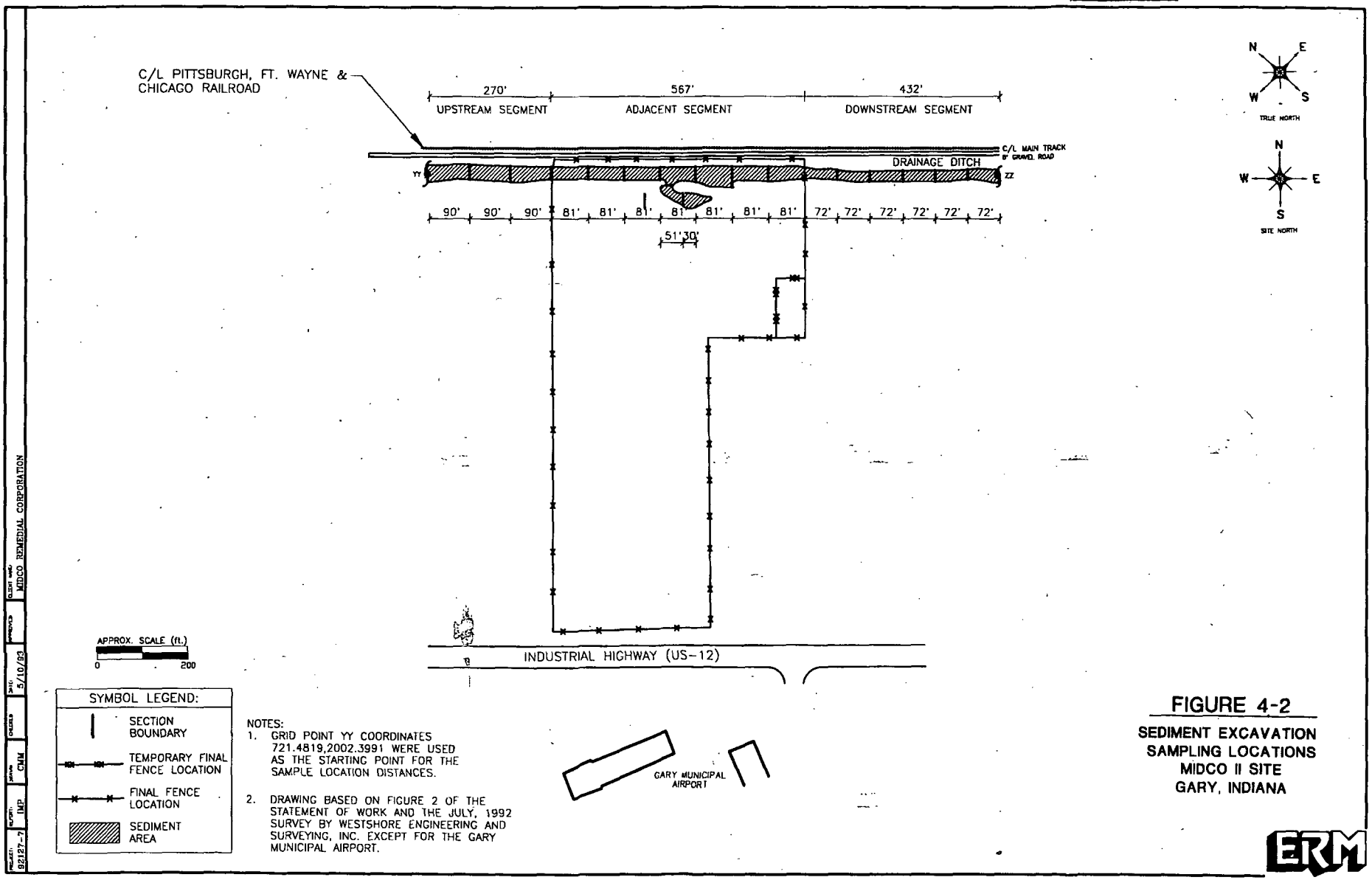


R:\Client Project Files\Midco\Alternate Remedy-Design.Bldg. Rpt 21-8601Z \Final July Report\Figures\Fig2 Midco II Site Layout.dwg

ENVIRON 740 Waukegan Road, Suite 401, Deerfield, IL 60015	Midco II Site Layout Gary, Indiana	Figure 2

Drafter: APR Date: 7/16/03 Contract Number: 21-8601Z Approved: Revised:

FIVE-YEAR REVIEW
FIGURE 3



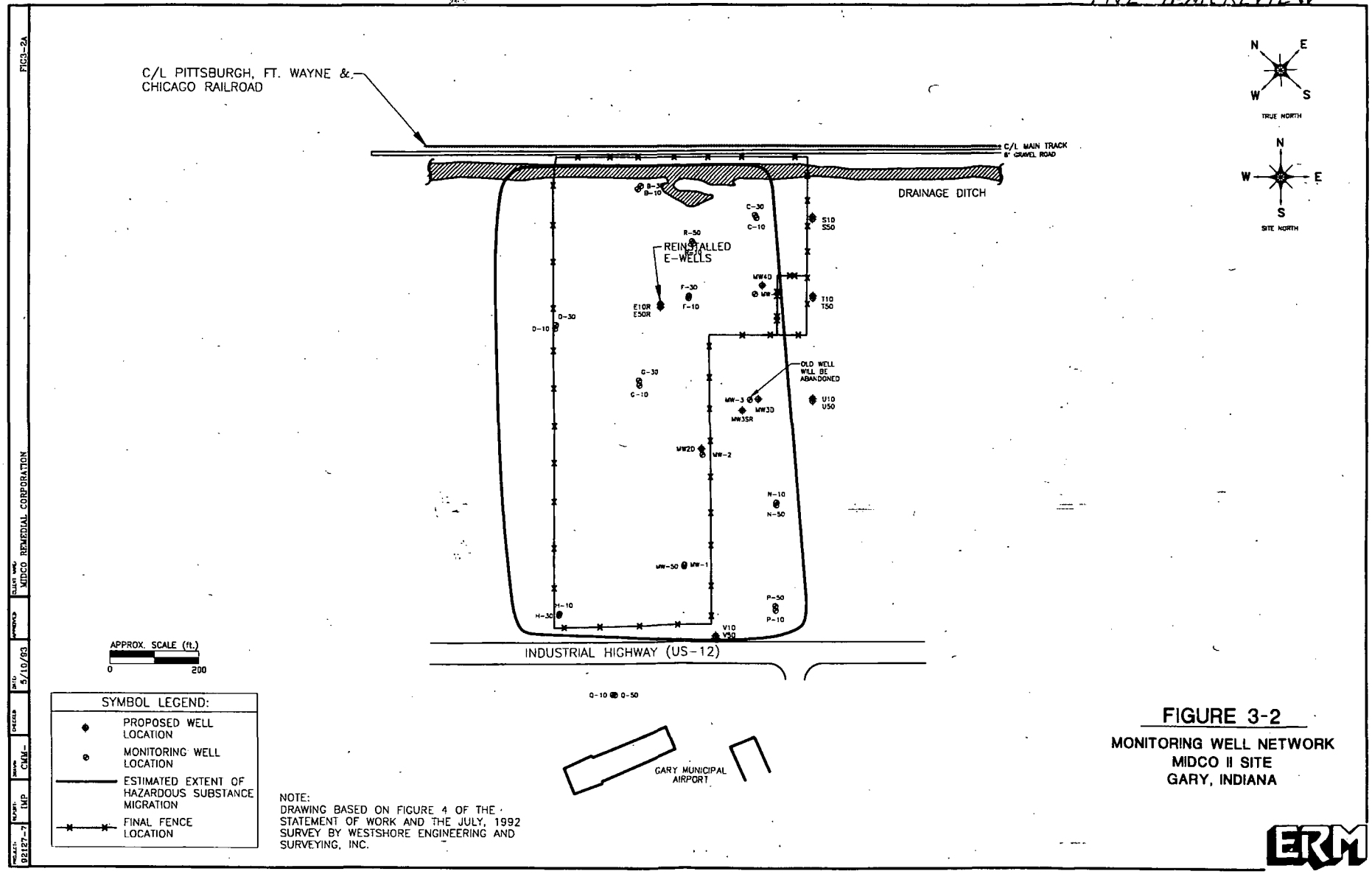
NOTES:
1. GRID POINT YY COORDINATES 721.4819,2002.3991 WERE USED AS THE STARTING POINT FOR THE SAMPLE LOCATION DISTANCES.
2. DRAWING BASED ON FIGURE 2 OF THE STATEMENT OF WORK AND THE JULY, 1992 SURVEY BY WESTSHORE ENGINEERING AND SURVEYING, INC. EXCEPT FOR THE GARY MUNICIPAL AIRPORT.

FIGURE 4-2

SEDIMENT EXCAVATION SAMPLING LOCATIONS MIDCO II SITE GARY, INDIANA

ERM

FIGURE 4
FIVE-YEAR REVIEW



NOTE:
DRAWING BASED ON FIGURE 4 OF THE STATEMENT OF WORK AND THE JULY, 1992 SURVEY BY WESTSHORE ENGINEERING AND SURVEYING, INC.

FIGURE 3-2

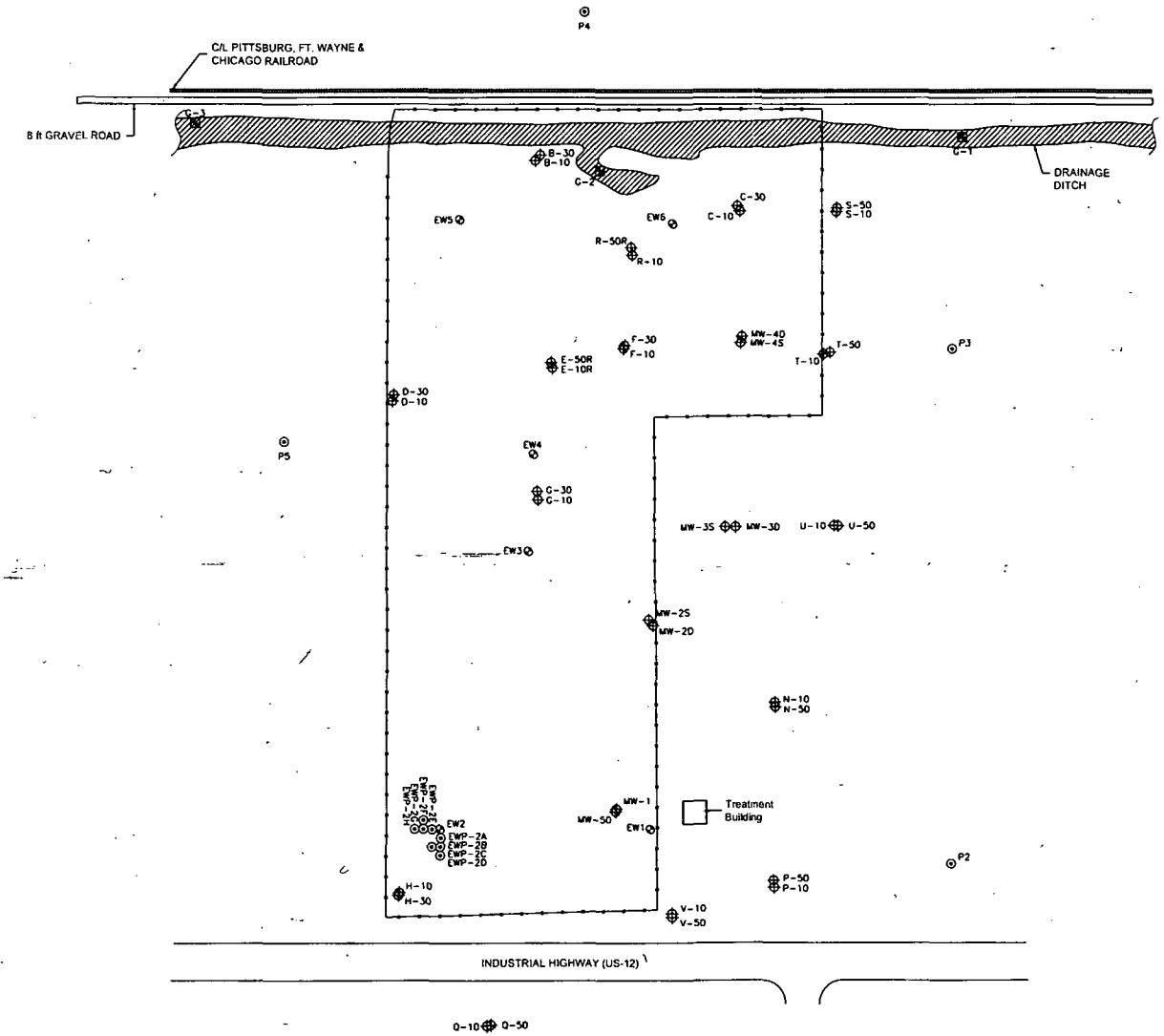
MONITORING WELL NETWORK
MIDCO II SITE
GARY, INDIANA

ERM

FIG3-2A
MIDCO REMEDIAL CORPORATION
5/10/93
CWM
IWP
92127-7

FIGURE 5

FIVE-YEAR REVIEW



LEGEND

- Fence
- Extraction Well Location
- Monitoring Well Location
- Piezometer Location
- Staff Gauge Location

APPROX. SCALE (ft.)

0 150

CP\Maps 2002 Annual Ground Water Sampling\Acad\Fig2-Well and Piezometer Locations.dwg

ENVIRON

740 Waukegan Road, Suite 401, Deerfield, IL 60015

Well and Piezometer Locations
Midco II Site
Gary, Indiana

DATE	CONTRACT NUMBER	
10/16/00	21-8601	2
DRAWN BY: APR	APPROVED: SCH	

Attachment 1

FIVE-YEAR REVIEW

APPENDIX 8

DEED RESTRICTION

_____, owner in fee simple of the real estate described below, hereby imposes restrictions on the described real estate ("_____ Property"), which is part of the Midco _ Facility, Township _____, Lake County, State of Indiana.

[Description of land]

Containing ___ acres, more or less.

The following restrictions are imposed on the _____ Property, its present and any future owners, their authorized agents, assigns, employees or persons acting under their direction or control, for the purpose of protecting public health and the environment and preventing interference with remedial action work and maintenance work approved by the United States Environmental Protection Agency ("USEPA") and/or the United States District Court for the Northern District of Indiana at the Midco _ Facility located at or about _____, Gary, Indiana ("Midco _ Facility").

1. Until the final approval by USEPA of the completion of all remedial action work and achievement of all cleanup and performance standards at the Midco _ Facility, there shall be no consumptive or other use of the groundwater underlying the _____ Property that could cause exposure of humans or animals to the groundwater underlying the _____ Property or the Midco _ Facility;

2. Until the final approval by USEPA of the completion of all remedial action work and achievement of all cleanup and performance standards at the Midco _ Facility, there shall be no residential, commercial, or agricultural use of the _____ Property, including but not limited to the construction, installation or use of any structures or buildings for residential, commercial, or agricultural purposes;

3. Until the final approval by USEPA of the completion of all remedial action work and achievement of all cleanup and performance standards at the Midco _ Facility, there shall be no use of the _____ Property that would allow the continued presence of humans at the _____ Property, other than presence necessary for implementation of remedial action work or maintenance work approved by USEPA and/or the United Stats District Court for the Northern District Court of Indiana. Prohibit uses which would allow the continued presence of humans at the _____ Property will include but not necessarily be limited to recreational and educational uses.

4. Until the final approval by USEPA of the completion of all remedial action work and achievement of all cleanup and performance standards at the Midco _ Facility, there shall be no installation, removal, construction or use of any buildings, wells, pipes, roads, ditches or any other structures at the _____ Property except as approved by USEPA.

5. There shall be no tampering with, or removal of, any containment or monitoring systems or remedial action work on the _____ Property.

6. There shall be no interference with the performance of work and remedial action, or with the maintenance of remedial measures approved by USEPA and/or the United States District Court for the Northern District of Indiana.

7. After the final approval by USEPA of the completion of all remedial action work and achievement of all cleanup and performance standards at the Midco _ Facility, all uses of the _____ Property shall be consistent with the final remedial action implemented at the Midco _ Facility.

All of the above restrictions shall run with the land and continue in perpetuity.

IN WITNESS WHEREOF, _____ has caused these Deed Restrictions to be executed this _____ day of _____, 199_.

_____

By:_____

ATTEST:

ATTACHMENT 2

LIST OF DOCUMENTS AND REFERENCES REVIEWED OR USED FOR THE 2004 FIVE-YEAR REVIEW

Remedial Investigation of Midwest Waste Disposal Company, Inc. (Midco II), Gary Indiana; Midco Trustees, March 1988.

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